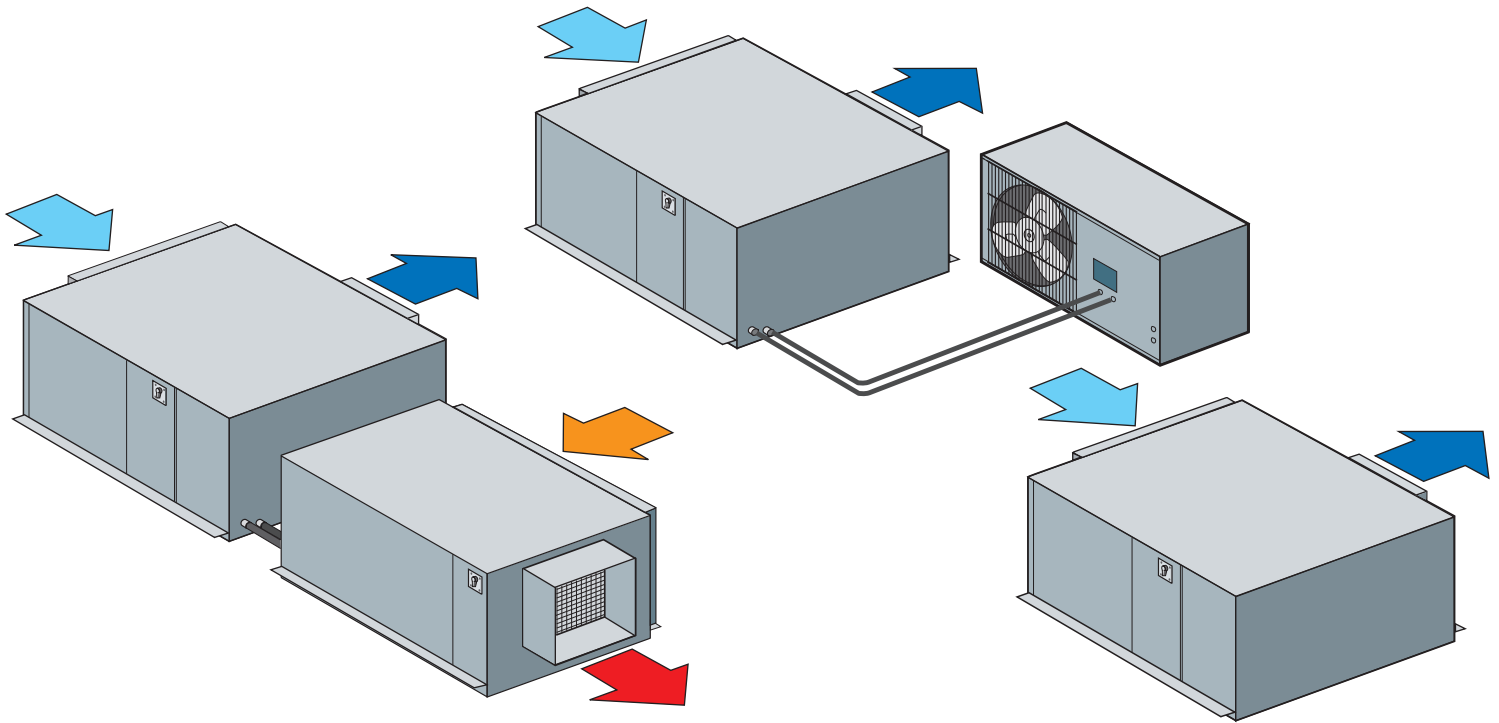


# Liebert® Mini-Mate2™—5-Ton (17.5 kW) Capacity

Technical Data Manual—Air, Water, Glycol, Chilled Water; 50&60Hz





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## 1.0 INTRODUCTION

### 1.1 Designed to Match Computer and Electronic Equipment Needs—From Installation to Operation

Installed above the ceiling, Liebert Mini-Mate2 Precision Cooling systems control the cooling, humidity and air distribution required by sensitive electronic equipment. A range of sizes and configurations is available to meet varying sites' needs.

The Liebert Mini-Mate2 is also easy to use. Advanced microprocessor technology allows easy, precise control, and menu-driven monitoring keeps you informed of system operation through the LCD readout. These features, combined with Emerson quality construction and reliable components, guarantee satisfaction from installation through operation.

#### Liebert Precision Cooling

Liebert Precision Cooling systems are designed to control the environment required for computers and other sensitive electronic equipment. The Liebert Mini-Mate2 provides complete control on an around-the-clock basis and the high sensible heat ratio required by sensitive electronic equipment.

#### Easy Installation

The Liebert Mini-Mate2 is a split-system evaporator combined with an air-, water- or glycol-cooled condensing unit or is a self-contained, chilled water unit. Each split system has thermostat-type wiring to controls and condensing unit. Optional sweat adapters assist with field refrigerant piping.

#### Easy to Service

Low-maintenance components are easily accessed through removable front panels. Spare parts are always in Emerson inventory and available on short notice.

#### Advanced Control Technology

A menu-driven microprocessor control system provides precise temperature and humidity control and accurate alarm setpoints. Using touch-sensitive buttons, the wall-mounted monitor/control panel allows you to select and display temperature and other monitored parameters.

#### High Efficiency

High sensible heat ratio, scroll compressor and precise microprocessor control allow the system to operate efficiently.

#### Space Saving Design

All indoor components are installed above the ceiling, so no floor space is required.

#### Reliable

The Liebert Mini-Mate2 family installed base is a testimony to the system reliability. Components include a rugged scroll compressor, high-efficiency copper tube, aluminum-fin evaporator coil and a double inlet, direct drive fan.

#### Agency Listed

Standard 60Hz units are CSA certified to the harmonized U.S. and Canadian product safety standard, CSA C22.2 No 236/UL 1995 for "Heating and Cooling Equipment" and are marked with the CSA c-us logo.



#### Location

When considering installation locations, consider that these units contain water and that water leaks can cause damage to sensitive equipment below. Do not mount these units above sensitive equipment. A field-supplied pan with drain must be supplied beneath cooling units and water/glycol condensers.

Do not mount units in areas where normal unit operating sound might disturb the working environment.

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## 2.0 STANDARD FEATURES—5 TON SYSTEMS

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### 2.1 Evaporator Section—Split System

The evaporator section is designed for ceiling installation. The cabinet and chassis are constructed of heavy gauge galvanized steel. The unit can be serviced using only one side increasing its versatility in mounting locations. Mounting brackets are factory-attached to the cabinet. Internal cabinet insulation meets ASHRAE 62.1 requirements for Mold Growth, Humidity & Erosion, tested per UL 181 & ASTM 1338 standards. The evaporator section includes the evaporator coil, R-407C unit charge, filter-drier, factory-mounted disconnect switch, adjustable belt-drive blower assembly and microprocessor control with wall-mounted control box. The unit is provided with supply and return air openings for field-supplied ducting. Evaporators can be configured with canister humidifier and/or reheat. An indoor or outdoor condensing unit must be selected for each evaporator.

### 2.2 Condensing Unit Section—Split System

#### 2.2.1 Indoor Centrifugal Fan Condensing Units

Indoor Air-Cooled Centrifugal Fan Condensing Units include scroll compressor, factory-mounted disconnect switch, condenser coil, R-407C unit charge, belt-driven centrifugal blower assembly, high-pressure switch, Liebert Lee-Temp™ head pressure control system, hot gas bypass and liquid-line solenoid valve. Unit must be mounted indoors. Condensing unit is designed to use outdoor air with temperatures ranging from -30°F to 95°F (-34°C to 35°C).

#### 2.2.2 Outdoor Prop Fan Condensing Units

Outdoor Prop Fan Condensing Units include scroll compressor, condenser coil, R-407C unit charge, prop fan, liquid-line solenoid valve, high pressure switch, Liebert Lee-Temp head pressure control and hot gas bypass. Condensing unit is designed for outdoor locations with operating ambients ranging from -30°F to 95°F (-34°C to 35°C).

#### 2.2.3 Indoor Water/Glycol Condensing Units

Indoor Water/Glycol Condensing Units includes scroll compressor, R-407C unit charge, factory-mounted disconnect, coaxial condenser, hot gas bypass, high head pressure switch and two-way water regulating valve designed for 150psi (1034.3kPa). Condensing units can be used on either a water or glycol cooling loop.

### 2.3 Chilled Water Units

Chilled Water Units are designed for ceiling installation. The cabinet and chassis are constructed of heavy gauge galvanized steel. The unit can be serviced using only one side increasing its versatility in mounting locations. Mounting brackets are factory-attached to the cabinet. Internal cabinet insulation meets ASHRAE 62.1 requirements for Mold Growth, Humidity & Erosion, tested per UL 181 & ASTM 1338 standards. Chilled water models are self-contained and include a chilled water coil, belt-driven centrifugal blower, factory-mounted disconnect switch and two-way, slow-close motorized valve. Design pressure is 300psi (2068kPa), 60psi (414kPa) close-off differential.

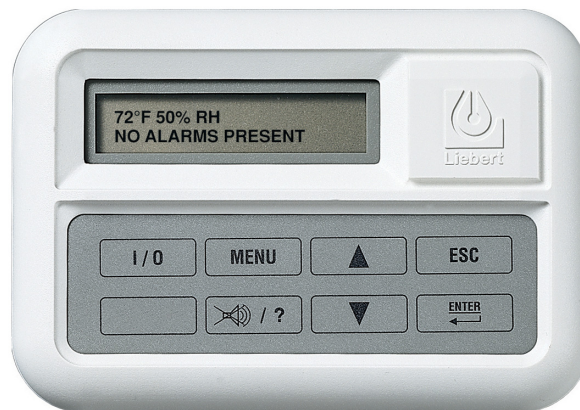


## 2.4 System Controls

**System controls** include a microprocessor control board mounted in the evaporator/chilled water unit and a wall-mounted interface with a two-line, 16-character liquid crystal display. A seven-key, membrane keypad for setpoint/program control, unit On/Off and alarm silence is below the LCD screen. It provides temperature setpoint and sensitivity adjustment, humidity setpoint and sensitivity adjustment, digital display of temperature, humidity, setpoints, sensitivities and alarm conditions.

The **wall-box** is field-wired to the microprocessor control using standard four-conductor thermostat wire (field-supplied). The temperature and humidity sensors are in the wall box, which can be installed up to 300 feet (91.4m) from the evaporator unit. The unit-mounted control board also includes common alarm terminals and shutdown terminals. The unit automatically restarts after a power outage.

**Figure 1 Wall-box**



### 2.4.1 Other Standard Control Features

- Adjustable auto restart
- 5 day/2 day setback
- Password protection
- Alarm enable/disable
- Self-diagnostics
- Calibrate sensors
- Predictive humidity control
- Common alarm output
- Remote shutdown terminals

## 3.0 OPTIONAL FACTORY-INSTALLED FEATURES - EVAPORATOR/CHILLED WATER UNITS

### 3.1 Reheat

**Electric Reheat** includes 304/304 stainless steel finned tubular reheat elements, with high limit safety switch.

**SCR Electric Reheat** uses an SCR controller and unit control software to provide full cooling with modulating of the electric reheat elements to control air temperatures. Reheat capacity is up-sized to offset the cooling capacity. (The SCR Electric Reheat is not available on chilled water, free-cooling or 575V units.)

**Hot Water Reheat** includes hot water coil, 2-way solenoid valve and Y-strainer.



#### NOTE

*This option is available only on Chilled Water units, but not with other reheat options.*

### 3.2 Humidifier

The **Canister Humidifier** includes a steam-generating type humidifier with automatic flushing circuit, inlet strainer, drain, 1" (25.4mm) air gap on fill line and solenoid valves. Humidifier problem alarm annunciates at the wall-mounted display panel.

**Remote Humidifier Contact** allows the unit's humidity controller to control a humidifier outside the unit. Power to operate the remote humidifier does not come from the Liebert Mini-Mate2. Available on units with or without internal humidifier.

### 3.3 Sensors

**Smoke Sensor** checks return air, shuts down the unit upon sensing smoke and activates visual and audible alarms at the wall-box display. This smoke sensor is not intended to function as or replace any smoke sensor system that may be required by local or national codes.

**High-Temperature Sensor** senses the return air temperature and shuts down unit if the temperature reaches 125°F (52°C). This device is not meant to replace any fire detection system that may be required by local or national codes.

### 3.4 Switches and Motors

**Filter Clog** senses pressure drop across the filters and activates visual and audible alarms at the wall-box display. The wall-box display annunciates the alarm audibly and flashes a notification upon reaching a customer setpoint.

A **Factory-Installed Non-Fused Disconnect Switch** allows unit to be turned off for maintenance. A disconnect switch is standard for the evaporators, chilled water units and indoor condensing units, but these units may be specified without the switch.

**2hp Blower Motor** is available for high static applications (0.9 to 1.5 in. [23 to 38 mm] w.g.).

### 3.5 Free-Cooling

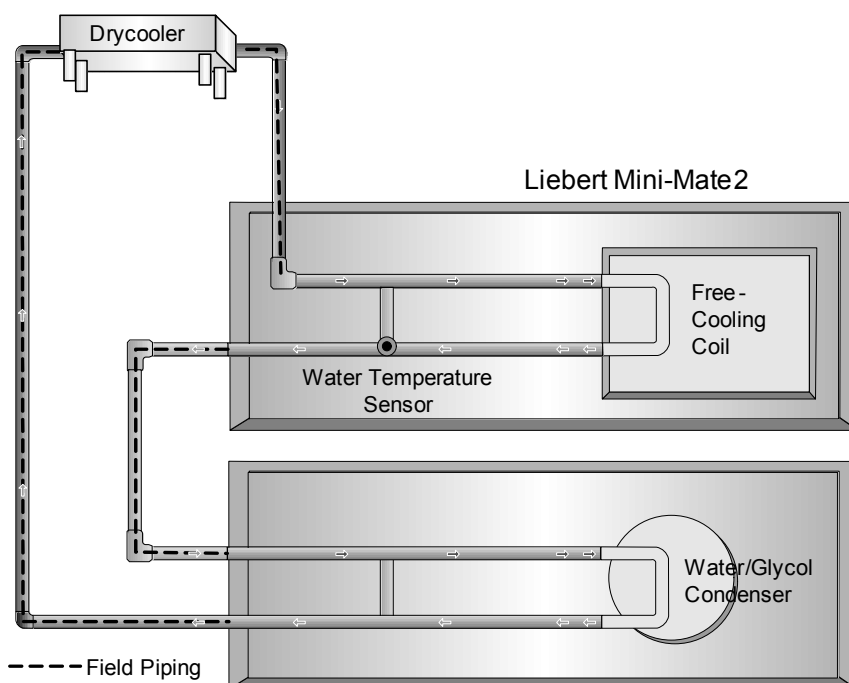
Free-cooling option includes separate cooling coil, three-way slow-close valve and separate supply and return piping. Free-cooling is activated when the water temperature reaches a field-adjustable temperature, typically 45°F (7°C). The valve is rated for 300psi (2068kPa) working pressure.

Air-cooled condensing units can be matched with evaporators using free-cooling coils with chilled water sources to serve as backup cooling. When matched with a water/glycol condensing unit, a three-way water regulating valve is recommended for the condensing unit to simplify piping to the main supply pipes. The coil is designed for closed-loop applications using properly treated and circulated fluid. Not available with SCR reheat options.

**Figure 2 Free-cooling arrangement**

**Free-cooling option:** A second cooling coil allows the system to take advantage of colder outdoor temperatures and bypass compressor operation.

When the water temperature goes below 45°F (7°C), cooling switches over to free-cooling operation. A separate chilled water source can also be used with air-cooled systems.



#### NOTE

*If free-cooling is applied to an open water tower, an optional cupro-nickel (CuNi) coil is required to prevent premature corrosion, or a heat exchanger must separate the tower water from the free-cooling loop. The cupro-nickel coil requires an extended lead time.*

### 3.6 Optional Configurations—Prop Fan Condensing Units

**Outdoor Prop Fan Condensing Units** are also available in the following optional configurations:

- High ambient, top discharge models for catalog capacities at ambient temperatures up to 105°F (40°C).
- Quiet-Line models for low noise level conditions (below 58 dBA) and catalog capacities for ambient temperatures up to 95°F (35°C).
- Condenser coil(s) can be phenolic-coated for extended coil life in coastal areas.

### 3.7 Optional Configurations—Water/Glycol Condensing Units

**Indoor Water/Glycol Condensing Units** are also available with the following piping options:

- Two-way water reg. valve with 350 psi (2413kPa) design pressure.
- Three-way water reg. valve with 150psi (1034kPa) design pressure.
- Three-way water reg. valve with 350psi (2413kPa) design pressure.

### **3.8 Optional Configurations—Chilled Water Units**

**Chilled Water Units** are also available with the following valve options:

- Three-way, slow-close, motorized chilled water valve rated for 300 psi (2068kPa) working pressure. Valve is non-spring return.
- Two-way modulating chilled water valve, rated for 400psi (2758kPa) operating pressure, 72psi (496kPa) close-off rating. Valve is non-spring return.
- Three-way modulating chilled water valve, rated for 400psi (2758kPa) operating pressure. Valve is non-spring return.

## 4.0 SHIP-LOOSE ACCESSORIES—FIELD-INSTALLED

**Filter Box** includes filter box with 1" (25.4mm) duct flange connection, quantity 2, 20" x 20" x 4" nominal (508mm x 508mm x 102mm) filters and a 1" (25.4 mm) duct flange for use on the supply air opening. Filters are MERV 8 efficiency per ASHRAE Standard 52.2-2007.

**Condensate Pump** is equipped with a discharge check valve. The pump is supplied with a mounting bracket for field-mounting onto ductwork and can be field-wired to the unit power block. A secondary float can be field-wired to shut down the unit upon high condensate level.

**Condensate Pump Mounting Bracket** is available for a mounting condensate pump on the end of the unit instead of on the duct work for easy alignment and installation of the condensate pump.

**Remote Temperature and Humidity Sensors** include sensors mounted in an attractive case with 30 ft. (9m) of cable. Installing the remote temperature and humidity sensor module disable the temperature and humidity sensors mounted in the wall box.

**Field-installed kits** are available for filter clog, smoke sensor, high temperature sensor, electric reheat and humidifier. The kits include installation instructions and are designed to be added to the evaporator unit before it is installed in the ceiling. Electric reheat kits cannot be installed in units with free-cooling.

**Refrigerant-line sweat adapter kit** contains two suction and two liquid-line compatible fittings that allow use of field-supplied, interconnecting refrigerant lines.

**Single Point Power Kit** contains the necessary electrical components to interconnect the high voltage sections of a close-coupled evaporator and indoor condensing unit.

### 4.1 Remote Monitoring, Autochangeover and Leak Detection Equipment

The **Liebert RCM4™** is a four-point, normally open, dry contact monitoring panel. One Form-C, dry contact common alarm relay output (rated at 24VAC, 3A) is provided. Four red LEDs illuminate on the respective alarm and the alarm buzzer is silenced by a front panel switch. The RCM4 requires a 24VAC or 24VDC power source. Power supply is not included.

The **Liebert AC4™ Autochangeover Controller** provides autochangeover and autosequence control for up to four Liebert Mini-Mate2 units within a room. The Liebert AC4 will enable redundant units in an alarm condition, balance usage and test standby units at programmed intervals. Two common alarm relay outputs are available. A built-in LCD and RS-232 port for direct PC/terminal connection provides two options for configuration and monitoring of the product. The Liebert AC4 requires 24VAC input power.

The **Liebert AC8™** is ideal for coordinated control of systems with redundant units. The Liebert AC8 enables redundant devices during an alarm condition, balances usage of devices and tests standby devices at programmable intervals. Supports four zones and can use the 4-20mA temperature sensor (TW420) for temperature staging in each zone. Two programmable output control relays are available for auxiliary control such as humidity lockout. Emergency power operation input provided for device control during an emergency. Two common alarm relay outputs are available. A built-in LCD and RS-232 port for direct PC/terminal connection provides two options for configuration and monitoring of the product.

The **Liebert ENV-DO™** interface card provides 16 discrete outputs, corresponding to status and major alarm conditions of Environmental units. The Liebert ENV-DO-ENCL1 packages one Environmental DO interface card in its own steel enclosure and the ENV-DO-ENCL2 packages two Environmental DO interface cards in one enclosure for installation external to the Liebert Mini-Mate2. The self-contained kit includes an external 120VAC-to-24VAC power transformer. Wiring harnesses are not provided. Power and communication wiring is field-provided.

The **Liebert Liqui-TECT® 410 Point Leak Detection Sensor** detects the presence of conductive liquid using a pair of corrosion-resistant, gold-plated probes mounted in a painted, height-adjustable enclosure. Dual Form-C, dry contact common alarm relays (rated at 24VAC, 3A) signal a leak detected as well as loss of power and cable fault. The Liebert Liqui-TECT 410 requires an external 24VAC or 24VDC power source.

**Liebert LT460 Zone Leak Detection Kits** include one LT460 sensor, a specified length of LT500-xxY cable (maximum length is 100 ft [30.5m]) and a corresponding number of hold-down clips. The Liebert LT460 requires an external 24VAC, 0.12A power source, such as EXT-XFMR or XFMR24.

**Liebert SiteScan®** is a monitoring solution that gives you decision-making power to effectively manage the equipment critical to your business.

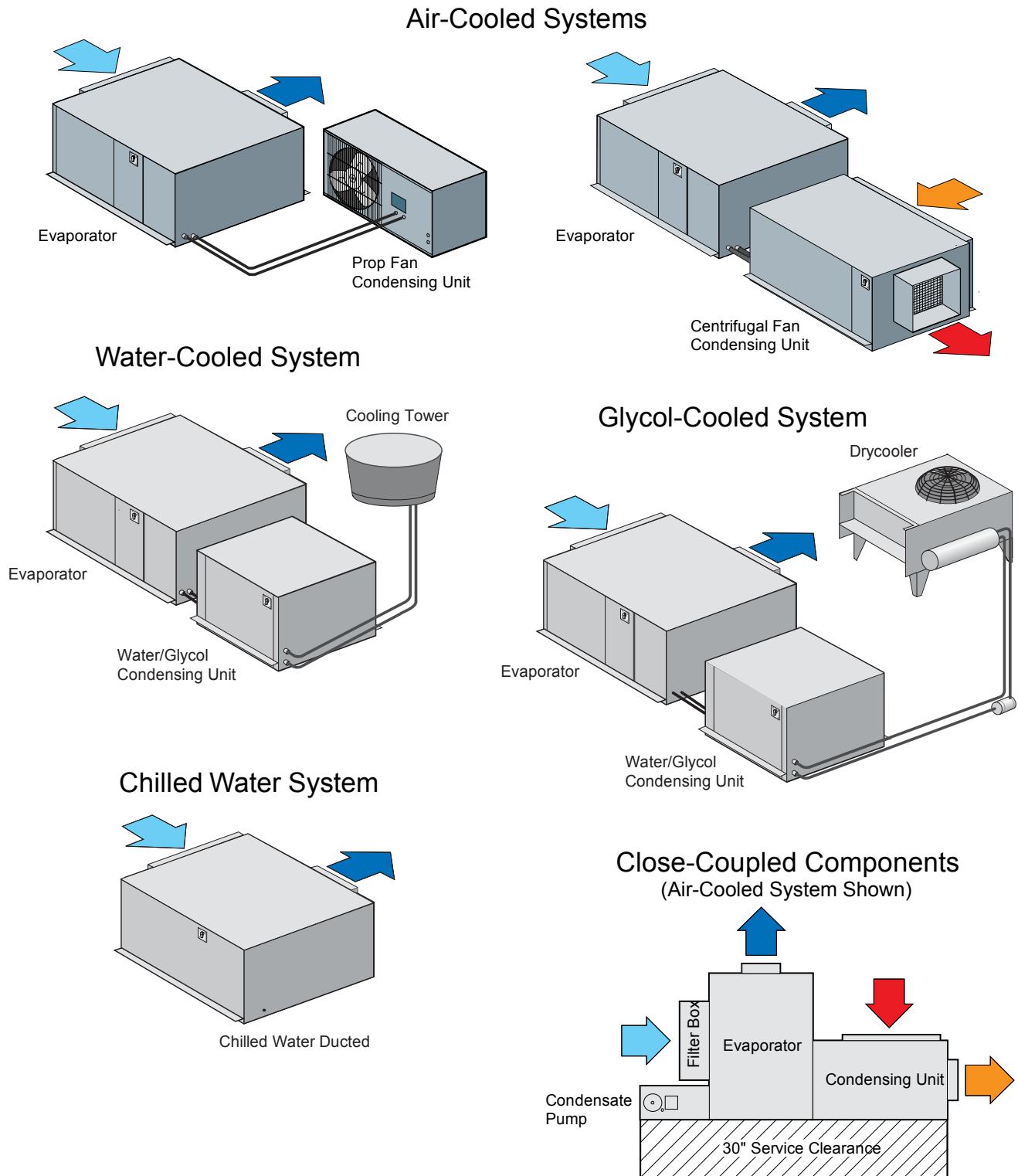
Liebert SiteScan enables communication from Liebert Precision Cooling and Power Protection units, as well as many other pieces of analog or digital equipment, to a front-end software package that provides real-time status and alarms so you can react quickly to changing situations.

Liebert SiteScan is designed with flexibility for both small systems and large, complex systems such as those in computer rooms, telecommunications facilities or industrial process control rooms. Contact your local Emerson representative for assistance with a Liebert SiteScan system.

The **NIC-ENCL1 and NIC-ENCL2** package one or two Liebert IntelliSlot® Web/485 Cards with Adapters, respectively, in one steel enclosure for installation external to the Liebert Mini-Mate2 . The Liebert IntelliSlot Web/485 Card with Adapter provides communication with the Liebert Mini-Mate2™ via SNMP, HTTP, RTU Modbus 485 and BACnet IP. The self-contained kit includes an external 120VAC-to-24VAC transformer as a power source. Wiring harnesses are not provided. Power and communication wiring are field-provided.

## 5.0 FLEXIBLE CONFIGURATIONS

Figure 3 Flexible configurations—all systems



## 6.0 AIR-COOLED SYSTEMS—CAPACITIES AND DIMENSIONS

**Table 1 Air-cooled data, 60Hz**

		With Outdoor Condensing Unit	With Centrifugal Condensing Unit
Evaporator Model		MMD60E or MMD60K	
Condensing Unit Type		PFH - Outdoor	MCD - Indoor
DX Evaporator- Net Capacity Data - kW (Btuh)			
80°F DB, 62.8°F WB (26.7°C DB, 17.1°C WB) 38% RH	Total	19.2 (65,400)	19.3 (65,700)
	Sensible	18.5 (63,000)	18.5 (63,200)
75°F DB, 61°F WB (23.9°C DB, 16.1°C WB) 45% RH	Total	18.4 (62,700)	18.5 (63,000)
	Sensible	16.4 (55,800)	16.4 (56,000)
72°F DB, 60°F WB (22.2°C DB, 15.5°C WB) 50% RH	Total	17.9 (61,200)	18.0 (61,500)
	Sensible	15.0 (51,300)	15.1 (51,500)
Fan Data - Evaporator			
CFM (CMH)		2500 (4248)	
Fan Motor hp (W)		1.5 (1119)	
External Static Pressure, in (mm) water gauge		0.5 (13)	
Evaporator Coil - Copper Tube/Aluminum Fin			
Face Area, ft2 (m2)		5.6 (0.52)	
Coil Rows		4	
Max Face Velocity, fpm (m/s)		444 (2.26)	
Unit Refrigerant Charge, oz. (kg)		4 (0.11)	
Unit Operating Weight		498 (226)	
Electric Reheat Capacity (Includes Fan Motor), kW (Btuh)			
All Voltages		11.5 (39,100)	
SCR Reheat Capacity (Includes Fan Motor), kW (Btuh)			
All Voltages, except 575-3-60		16.5 (56,200)	
Humidifier Data - Steam Generator Type			
Steam capacity, lb/hr (kg/hr)		8 (3.6)	
Electrical Input Power, kW		2.8	
Evaporator Connection Sizes			
Liquid line Diameter - Aeroquip Coupling Size		1/2" - #10 Female	
Suction Line Diameter - Aeroquip Coupling Size		1-1/8" - #12 Female	
Humidifier Supply		1/4" OD Cu Compression Fitting	
Evaporator/Condensate Drain		3/4" NPT-Female	
MERV 8 Filter - Nominal Size, qty 2; in. (mm)		4x20x20 (102x508x208)	
Condensing Unit Model Number		PFH067A-_L7 *	MCD65AL_H7
Condensing Unit Rating Conditions		95°F (35°C) Inlet Air Temperature	
Coil Face Area, ft <sup>2</sup> (m <sup>2</sup> )		10.5 (0.98)	7.3 (0.68)
Rows of Coil		3	4
CFM (CMH)		4200 (7140)	3500 (5947)
Motor, Hp (W)		0.5 (373)	2.0 (1.5)
External Static Pressure, in wg. (mm)		N/A	0.50 (13)
Unit Refrigerant Charge, oz. (kg)		426 (12.1)	432 (12.2)
Unit Operating Weight, lb. (kg)		351 (159)	449 (204)
Free-Cooling Coil Option Net Capacity Data - kW (Btuh) using 45°F EWT			
80°F DB, 62.8°F WB (26.7°C DB, 17.1°C WB) 38% RH	Total	18.9 (64,500)	
	Sensible	18.0 (61,500)	
75°F DB, 61°F WB (23.9°C DB, 16.1°C WB) 45% RH	Total	16.3 (55,600)	
	Sensible	15.1 (51,500)	
72°F DB, 60°F WB (22.2°C DB, 15.5°C WB) 50% RH	Total	14.8 (50,400)	
	Sensible	13.3 (45,400)	
Flow Rate, GPM (l/m)		12.0 (45.5)	
Pressure Drop, ft. water (kPa)		12.4 (37.1)	
Free-Cooling Coil - Copper Tube/Aluminum Fin			
Face Area, ft <sup>2</sup> (m <sup>2</sup> )		5.6 (0.52)	
Coil Rows		4	
Max Face Velocity, fpm (m/s)		444 (2.26)	
Internal Fluid Volume, gal (l)		2.3 (8.7)	
Water supply and return connections, in (mm) OD		1-1/8 (28.6)	

The net capacity data has fan motor heat factored in for all ratings and the entering air conditions of 75°F (23.9°C), 45%RH, is the standard rating condition for ASHRAE 127-2007. All capacities are nominal values; actual performance will be ± 5%.

\* Capacities are also valid for Liebert Quiet-Line PFH at 95F (35C) inlet air temperature and for High Ambient PFH models at 105°F (41°C) inlet air temperature.



Table 2 Air-cooled data, 50Hz

		With Outdoor Condensing Unit	With Centrifugal Condensing Unit
Evaporator Model		MMD59E or MMD59K	
Condensing Unit Type		PFH - Outdoor	MCD - Indoor
DX Evaporator- Net Capacity Data, kW (Btuh)			
80°F DB, 62.8°F WB (26.7°C DB, 17.1°C WB) 38% RH	Total	18.1 (61,600)	17.9 (61,000)
	Sensible	17.8 (60,700)	17.7 (60,400)
75°F DB, 61°F WB (23.9°C DB, 16.1°C WB) 45% RH	Total	17.2 (58,800)	17.1 (58,300)
	Sensible	15.8 (53,900)	15.7 (53,700)
72°F DB, 60°F WB (22.2°C DB, 15.5°C WB) 50% RH	Total	16.8 (57,300)	16.7 (56,900)
	Sensible	14.5 (49,500)	14.4 (49,300)
Fan Data - Evaporator			
CFM (CMH)		2500 (4248)	
Fan Motor hp (W)		1.5 (1119)	
External Static Pressure, in (mm) water gauge		0.5 (13)	
Evaporator Coil - Copper Tube/Aluminum Fin			
Face Area ft <sup>2</sup> (m <sup>2</sup> )		5.6 (0.52)	
Coil Rows		4	
Max Face Velocity-fpm (m/s)		444 (2.26)	
Unit Refrigerant Charge, oz. (kg)		4 (0.11)	
Unit Operating Weight		498 (226)	
Electric Reheat Capacity (Includes Fan Motor)-kW (Btuh)			
Input Voltage-380-3-50		10.5 (35,800)	
Input Voltage-400-3-50		9	
SCR Reheat Capacity (Includes Fan Motor)-kW (Btuh)			
Input Voltage-380-3-50		15.0 (51,200)	
Input Voltage-400-3-50		16.5 (56,200)	
Humidifier Data - Steam Generator Type			
Steam capacity - lbs/hr (kg/hr)		8 (3.6)	
Electrical Input Power - kW		2.8	
Evaporator Connection Sizes			
Liquid line Diameter - Aeroquip Coupling Size		1/2" - #10 Female	
Suction Line Diameter - Aeroquip Coupling Size		1-1/8" - #12 Female	
Humidifier Supply		1/4" OD Cu Compression Fitting	
Evaporator/Condensate Drain		3/4" NPT-Female	
MERV 8 Filter - Nominal Size, qty 2; in. (mm)		4x20x20 (102x508x208)	
Condensing Unit Model Number		PFH066A-L7	MCD64AL_H7
Condensing Unit Rating Conditions		95°F (35°C) Inlet Air Temperature	
Coil Face Area ft <sup>2</sup> (m <sup>2</sup> )		10.5 (0.98)	7.3 (0.68)
Rows of Coil		3	4
CFM (CMH)		3600 (6116)	3500 (5947)
Motor Hp (W)		0.5 (373)	2.0 (1.5)
External Static Pressure, in wg. (mm)		N/A	0.50 (13)
Unit Refrigerant Charge, oz. (kg)		426 (12.1)	432 (12.2)
Unit Operating Weight, lb. (kg)		351 (159)	449 (204)
Free-Cooling Coil Option Net Capacity Data - kW (Btuh) using 45°F EWT			
80°F DB, 62.8°F WB (26.7°C DB, 17.1°C WB) 38% RH	Total	18.9 (64,500)	
	Sensible	18.0 (61,500)	
75°F DB, 61°F WB (23.9°C DB, 16.1°C WB) 45% RH	Total	16.3 (55,600)	
	Sensible	15.1 (51,500)	
72°F DB, 60°F WB (22.2°C DB, 15.5°C WB) 50% RH	Total	14.8 (50,400)	
	Sensible	13.3 (45,400)	
Flow Rate - GPM (l/m)		12.0 (45.5)	
Pressure Drop - ft. water (kPa)		12.4 (37.1)	
Free-Cooling Coil - Copper Tube/Aluminum Fin			
Face Area ft <sup>2</sup> (m <sup>2</sup> )		5.6 (0.52)	
Coil Rows		4	
Max Face Velocity-fpm (m/s)		444 (2.26)	
Internal Fluid Volume - gal (l)		2.3 (8.7)	
Water supply and return connections, in (mm) OD		1-1/8 (28.6)	

The net capacity data has fan motor heat factored in for all ratings and the entering air conditions of 75°F (23.9°C), 45%RH, is the standard rating condition for ASHRAE 127-2007. All capacities are nominal values; actual performance will be ± 5%.

\* Capacities are also valid for Quiet-Line PFH at 95F (35C) inlet air temperature and for High Ambient PFH models at 105F (41C) inlet air temperature.

Figure 4 General arrangement diagram, air-cooled split systems

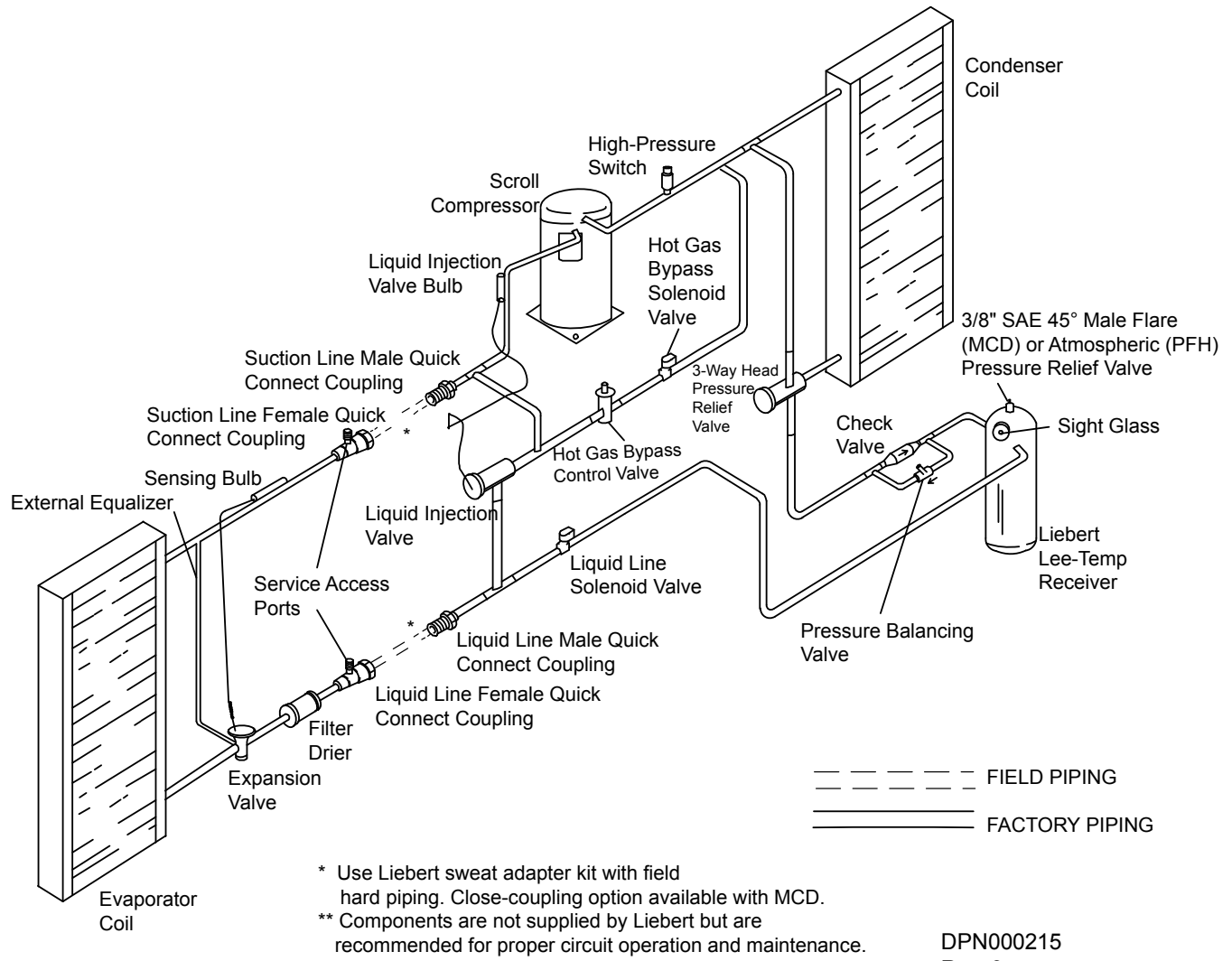
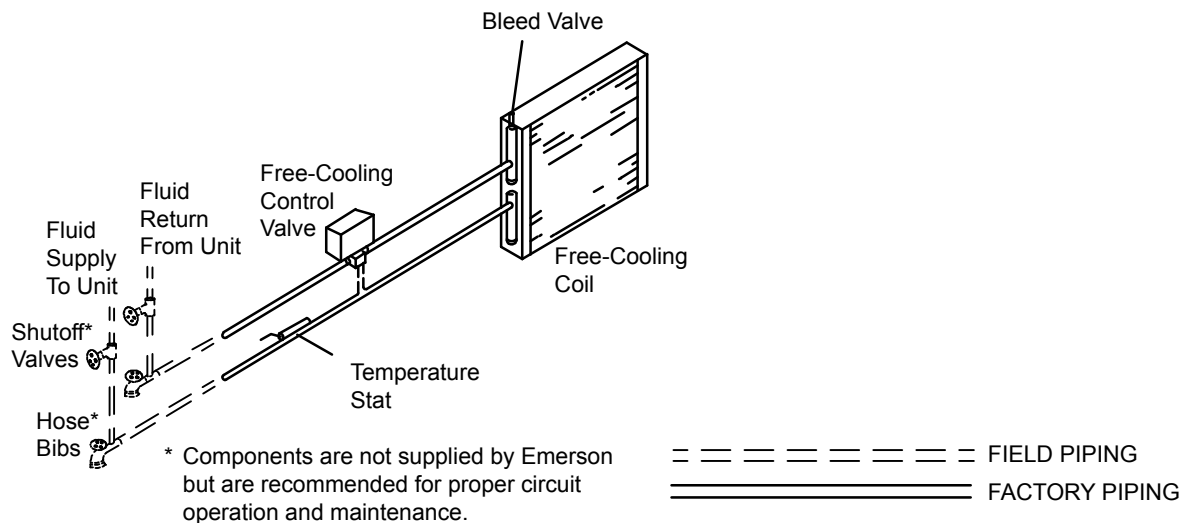
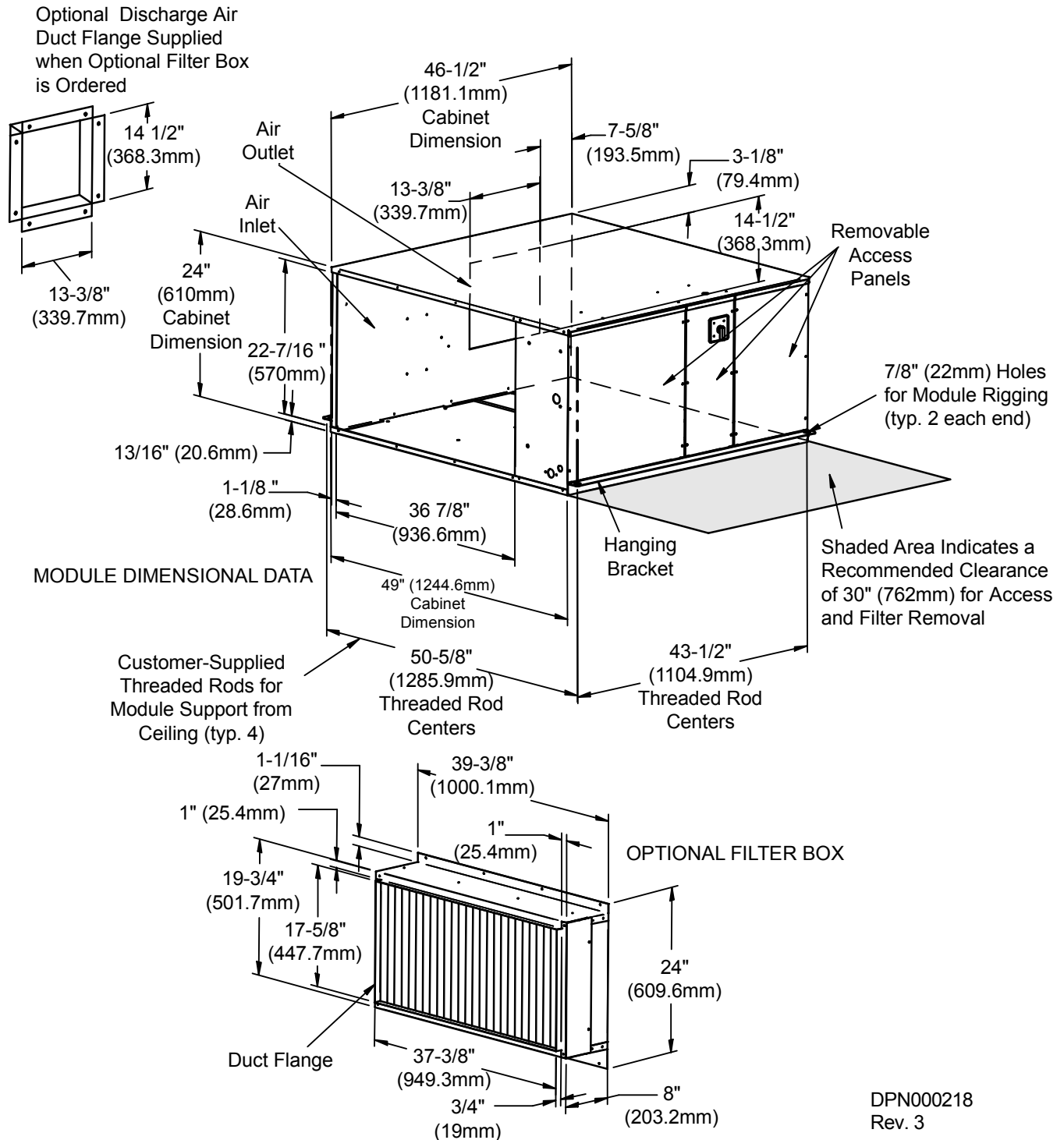


Figure 5 Free-cooling arrangement, air-cooled units



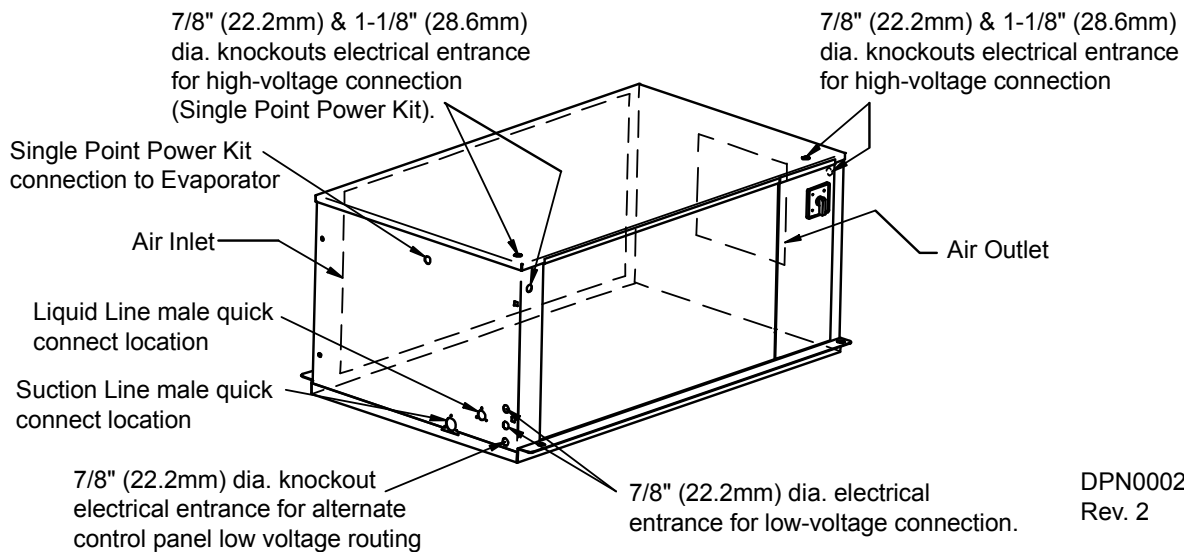
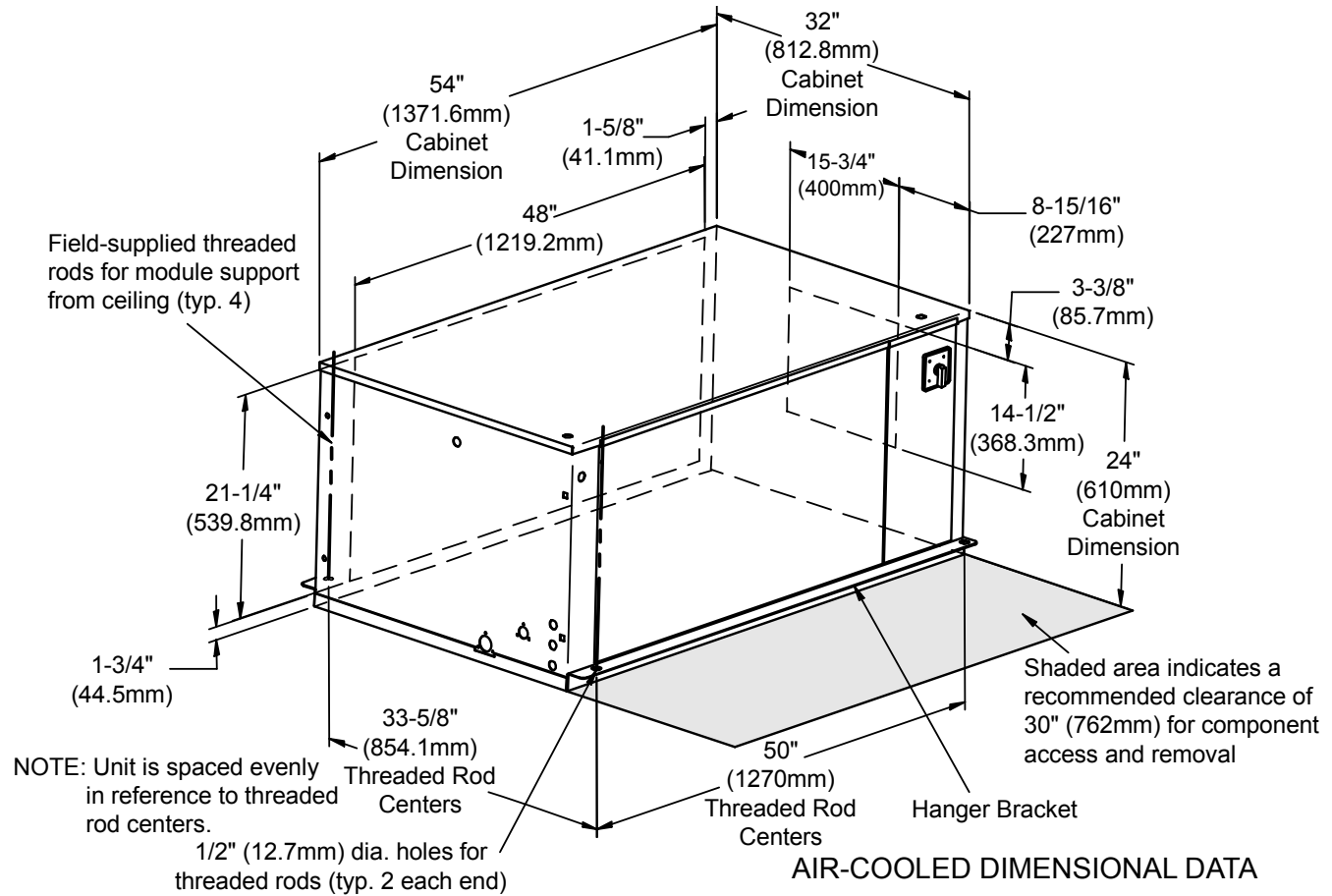
**Figure 6 Dimensions—Evaporator module**

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**Table 3 Evaporator module net weights—air-cooled systems**

Model #		Weight, lb (kg)
60Hz	50Hz	
MM*60E	MM*59E	498 (226)
MM*60K	MM*59K	530 (240)

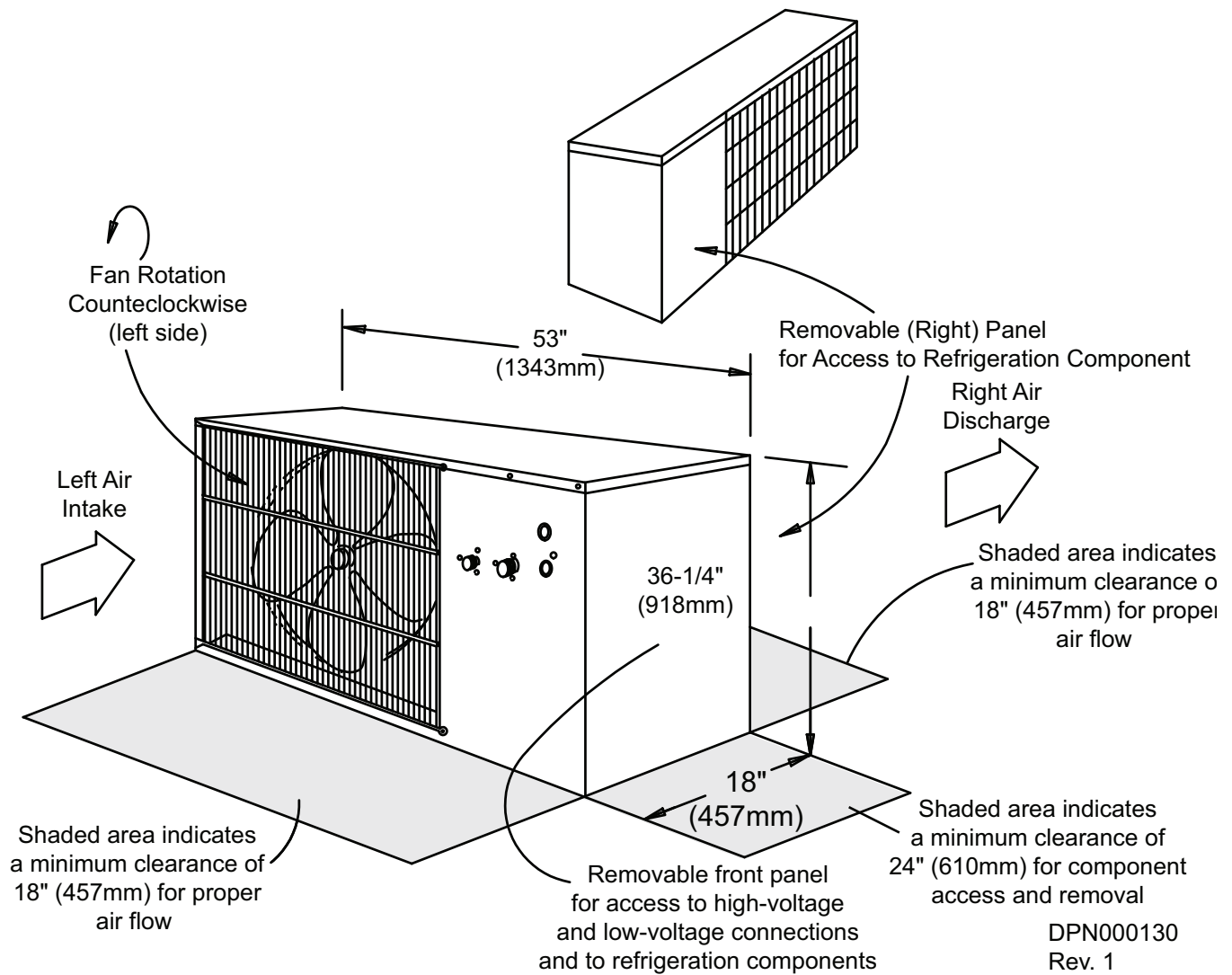
**Figure 7 Dimensions—Indoor air-cooled condensing module**



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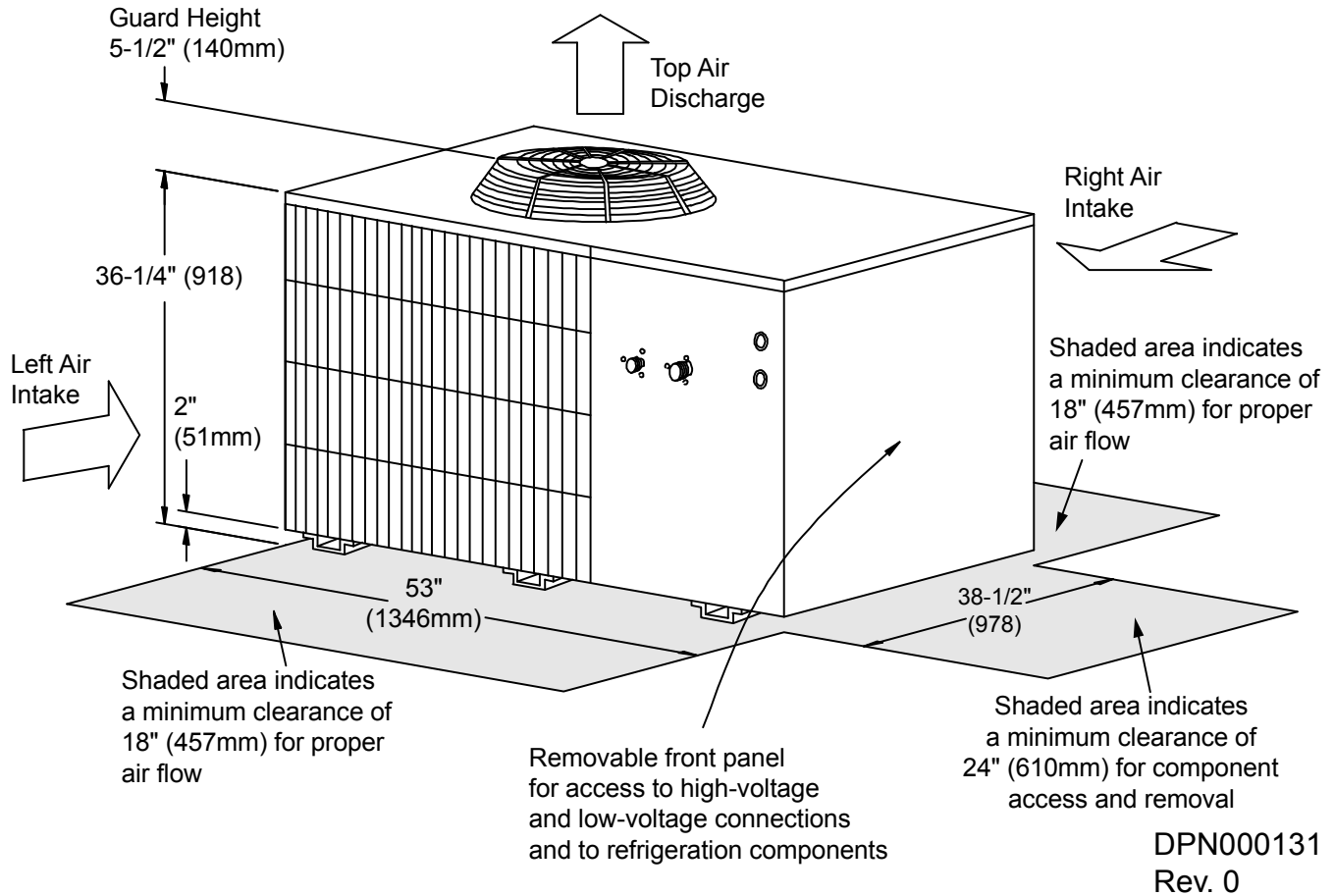
**Table 4 Net weight, indoor condensing module, air-cooled systems**

Model #		Weight, lb (kg)
60Hz	50Hz	
MC*65A	MC*64A	449 (204)

**Figure 8** Dimensions—Air-cooled systems, standard ambient outdoor condensing module**Table 5** Weights for standard ambient outdoor condensing modules, air-cooled systems

Model #		Weight, lb (kg)
60Hz	50Hz	
PFH067A-L	PFH066A-L	351 (159)

**Figure 9 Dimensions—Air-cooled systems, high ambient and Quiet-Line condensing module**



**Table 6 Net weight, high ambient and Quiet-Line condensing modules, air-cooled systems**

Model #		Module Net Weight lb. (kg)
60Hz	50Hz	
PFH067A- H PFHZ67A- L	PFH066A- H PFHZ66A- L	488 (222)

## 7.0 WATER/GLYCOL-COOLED SYSTEMS—CAPACITIES AND DIMENSIONS

**Table 7 Water/glycol data, 60Hz**

Evaporator Model		MMD60E or MMD60K	
Condensing Unit Fluid		Water-Cooled	Glycol-Cooled
Net Capacity Data DX Evaporator, kW (Btuh)			
80°F DB, 62.8°F WB (26.7°C DB, 17.1°C WB) 38% RH	Total	21.5 (73,500)	18.2 (62,200)
	Sensible	19.6 (67,000)	17.9 (61,200)
75°F DB, 61°F WB (23.9°C DB, 16.1°C WB) 45% RH	Total	20.8 (70,800)	17.4 (59,500)
	Sensible	17.5 (59,600)	15.9 (54,300)
72°F DB, 60°F WB (22.2°C DB, 15.5°C WB) 50% RH	Total	20.3 (69,200)	17.0 (58,000)
	Sensible	16.1 (55,000)	14.6 (49,800)
Fan Data - Evaporator			
CFM (CMH)		2500 (4248)	
Fan Motor, hp (W)		1.5 (1119)	
External Static Pressure, in (mm) water gauge		0.5 (13)	
Evaporator Coil - Copper Tube/Aluminum Fin			
Face Area, ft² (m²)		5.6 (0.52)	
Coil Rows		4	
Max Face Velocity-fpm (m/s)		444 (2.26)	
Unit Refrigerant Charge, oz. (kg)		4 (0.11)	
Unit Operating Weight		498 (226)	
Electric Reheat Capacity (Includes Fan Motor), kW (Btuh)			
All Voltages		11.5 (39,100)	
SCR Reheat Capacity (Includes Fan Motor), kW (Btuh)			
All Voltages, except 575-3-60		16.5 (56,200)	
Humidifier Data - Steam Generator Type			
Steam capacity, lbs/hr (kg/hr)		8 (3.6)	
Electrical Input Power, kW		2.8	
Evaporator Connection Sizes			
Liquid line Diameter - Aeroquip Coupling Size		1/2" - #10 Female	
Suction Line Diameter - Aeroquip Coupling Size		1-1/8" - #12 Female	
Humidifier Supply		1/4" OD Cu Compression Fitting	
Evaporator/Condensate Drain		3/4" NPT-Female	
MERV 8 Filter - Nominal Size, qty 2; in. (mm)		4 x 20 x 20 (102 x 508 x 208)	
Condensing Unit Model Number		MCD69W	
Condenser Fluid Requirements		85°F (29.4°C) EWT	110°F (43.3°C) EGT - 40% PG
THR - kW (Btuh) @ 75F/45%RH		27.6 (94,200)	25.9 (88,400)
Flow Rate, GPM (l/m)		16.4 (62.2)	20.1 (76.2)
Pressure Drop, ft. of H <sub>2</sub> O (kPa)		21.7 (64.9)	38.9 (116.3)
Water-Cooled Condensing Temperature		105°F (40.6°C)	N/A
Unit Volume, gal (l)		2.0 (7.5)	
Unit Refrigerant Charge, oz. (kg)		94 (2.7)	
Unit Operating Weight, lb. (kg)		282 (128)	
Free-Cooling Coil Option Net Capacity Data, kW (Btuh) using 45°F EWT			
Entering Fluid Requirements		45°F (29.4°C) EWT	45°F (29.4°C) EGT - 40% PG
80°F DB, 62.8°F WB (26.7°C DB, 17.1°C WB) 38% RH	Total	18.9 (64,500)	14.1 (48,500)
	Sensible	18.0 (61,500)	14.1 (48,500)
75°F DB, 61°F WB (23.9°C DB, 16.1°C WB) 45% RH	Total	16.3 (55,600)	11.7 (40,000)
	Sensible	15.1 (51,500)	11.7 (40,000)
72°F DB, 60°F WB (22.2°C DB, 15.5°C WB) 50% RH	Total	14.8 (50,400)	10.7 (36,400)
	Sensible	13.3 (45,400)	10.7 (36,400)
Flow Rate, GPM (l/m)		12.0 (45.5)	20.1 (76.2)
Pressure Drop, ft. water (kPa)		12.4 (37.1)	50.4 (150.7)
Free-Cooling Coil - Copper Tube/Aluminum Fin			
Face Area, ft² (m²)		5.6 (0.52)	
Coil Rows		4	
Max Face Velocity, fpm (m/s)		444 (2.26)	
Internal Fluid Volume, gal (l)		2.3 (8.7)	
Water supply and return connections, in (mm) OD		1-1/8 (28.6)	

The net capacity data has fan motor heat factored in for all ratings and the entering air conditions of 75°F (23.9°C), 45%RH, is the standard rating condition for ASHRAE 127-2007. All capacities are nominal values; actual performance will be ± 5%.

Table 8 Water/glycol data, 50Hz

Evaporator Model		MMD59E or MMD59K	
Condensing Unit Fluid		Water-Cooled	Glycol-Cooled
Net Capacity Data DX Evaporator- kW (Btuh)			
80°F DB, 62.8°F WB (26.7°C DB, 17.1°C WB) 38% RH	Total	20.7 (70,700)	16.9 (57,800)
	Sensible	19.3 (65,700)	16.9 (57,800)
75°F DB, 61°F WB (23.9°C DB, 16.1°C WB) 45% RH	Total	19.9 (68,000)	16.1 (54,900)
	Sensible	17.1 (58,300)	15.2 (52,000)
72°F DB, 60°F WB (22.2°C DB, 15.5°C WB) 50% RH	Total	19.5 (66,500)	15.7 (53,500)
	Sensible	15.7 (53,700)	14.0 (47,700)
Fan Data - Evaporator			
CFM (CMH)		2500 (4248)	
Fan Motor hp (W)		1.5 (1119)	
External Static Pressure, in (mm) water gauge		0.5 (13)	
Evaporator Coil - Copper Tube/Aluminum Fin			
Face Area ft <sup>2</sup> (m <sup>2</sup> )		5.6 (0.52)	
Coil Rows		4	
Max Face Velocity-fpm (m/s)		444 (2.26)	
Unit Refrigerant Charge, oz. (kg)		4 (0.11)	
Unit Operating Weight		498 (226)	
Electric Reheat Capacity (Includes Fan Motor)-kW (Btuh)			
Input Voltage-380-3-50		10.5 (35,800)	
Input Voltage-400-3-50		11.5 (39,100)	
SCR Reheat Capacity (Includes Fan Motor)-kW (Btuh)			
Input Voltage-380-3-50		15.0 (51,200)	
Input Voltage-400-3-50		16.5 (56,200)	
Humidifier Data - Steam Generator Type			
Steam capacity - lb/hr (kg/hr)		8 (3.6)	
Electrical Input Power - kW		2.8	
Evaporator Connection Sizes			
Liquid line Diameter - Aeroquip Coupling Size		1/2" - #10 Female	
Suction Line Diameter - Aeroquip Coupling Size		1-1/8" - #12 Female	
Humidifier Supply		1/4" OD Copper Compression Fitting	
Evaporator/Condensate Drain		3/4" NPT-Female	
MERV 8 Filter - Nominal Size, qty 2; in. (mm)		4x20x20 (102x508x208)	
Condensing Unit Model Number		MCD68W	
Condenser Fluid Requirements		85°F (29.4°C) EWT	110°F (43.3°C) EGT - 40% PG
THR - kW (Btuh) @ 75F/45%RH		25.3 (86,400)	24.7 (84,300)
Flow Rate - GPM (l/m)		15.6 (59.1)	19.0 (72.0)
Pressure Drop - ft. of H <sub>2</sub> O (kPa)		19.5 (58.3)	34.7 (103.8)
Water-Cooled Condensing Temperature		105°F (40.6°C)	N/A
Unit Volume - Gal (l)		2.0 (7.5)	
Unit Refrigerant Charge, oz. (kg)		94 (2.7)	
Unit Operating Weight, lb. (kg)		282 (128)	
Free-Cooling Coil Option Net Capacity Data - kW (Btuh) using 45°F EWT			
Entering Fluid Requirements		45°F (29.4°C) EWT	45°F EGT - 40% PG
80°F DB, 62.8°F WB (26.7°C DB, 17.1°C WB) 38% RH	Total	18.9 (64,500)	14.0 (47,700)
	Sensible	18.0 (61,500)	14.0 (47,700)
75°F DB, 61°F WB (23.9°C DB, 16.1°C WB) 45% RH	Total	16.3 (55,600)	11.8 (40,400)
	Sensible	15.1 (51,500)	11.8 (40,400)
72°F DB, 60°F WB (22.2°C DB, 15.5°C WB) 50% RH	Total	14.8 (50,400)	10.5 (35,900)
	Sensible	13.3 (45,400)	10.5 (35,900)
Flow Rate - GPM (l/m)		12.0 (45.5)	19.0 (72.0)
Pressure Drop - ft. water (kPa)		12.4 (37.1)	45.5 (136.0)
Free-Cooling Coil - Copper Tube/Aluminum Fin			
Face Area ft <sup>2</sup> (m <sup>2</sup> )		5.6 (0.52)	
Coil Rows		4	
Max Face Velocity-fpm (m/s)		444 (2.26)	
Internal Fluid Volume - gal (l)		2.3 (8.7)	
Water supply and return connections, in (mm) OD		1-1/8 (28.6)	

The net capacity data has fan motor heat factored in for all ratings and the entering air conditions of 75°F (23.9°C), 45%RH, is the standard rating condition for ASHRAE 127-2007. All capacities are nominal values; actual performance will be ± 5%.



Figure 10 General arrangement diagram water/glycol split systems

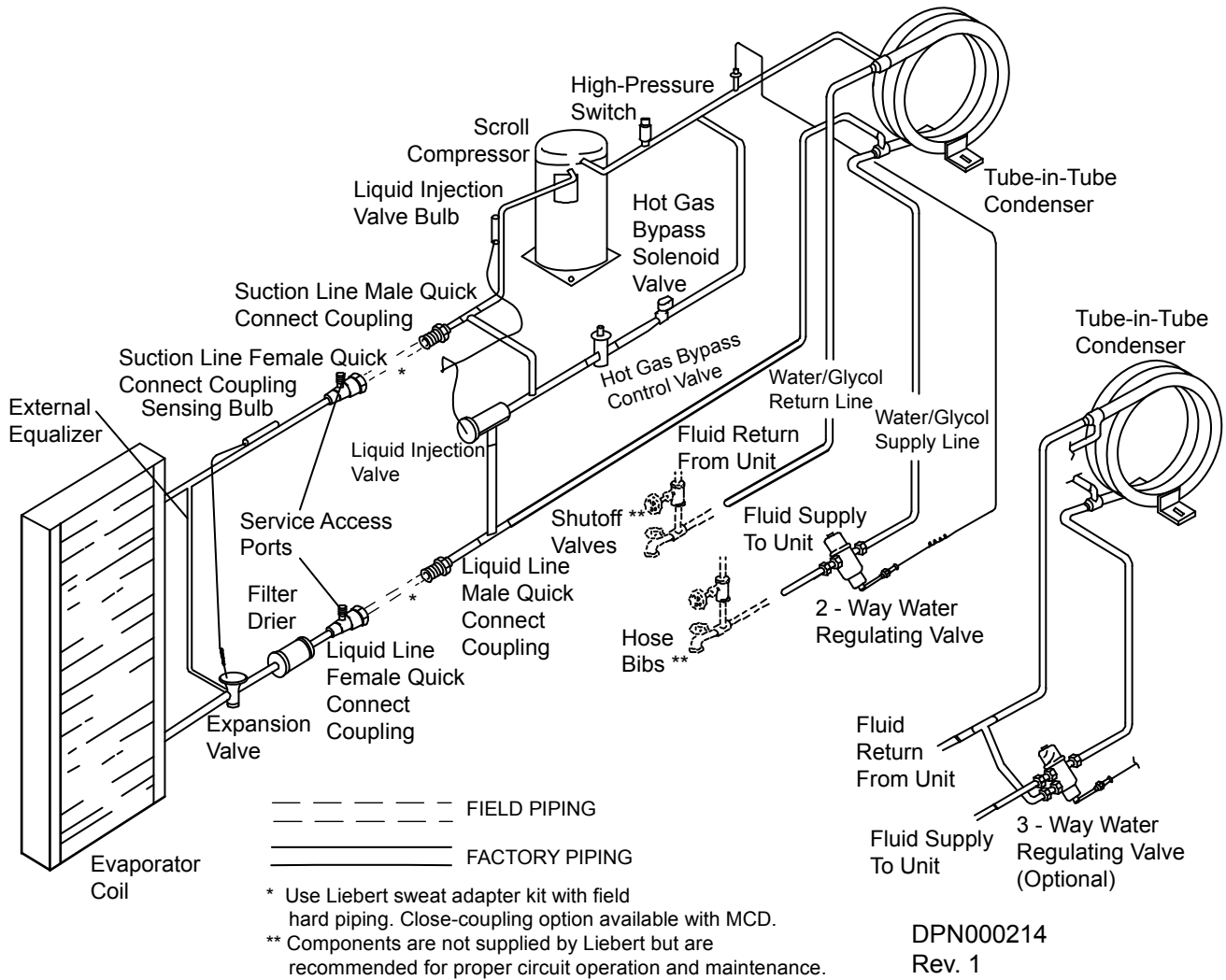
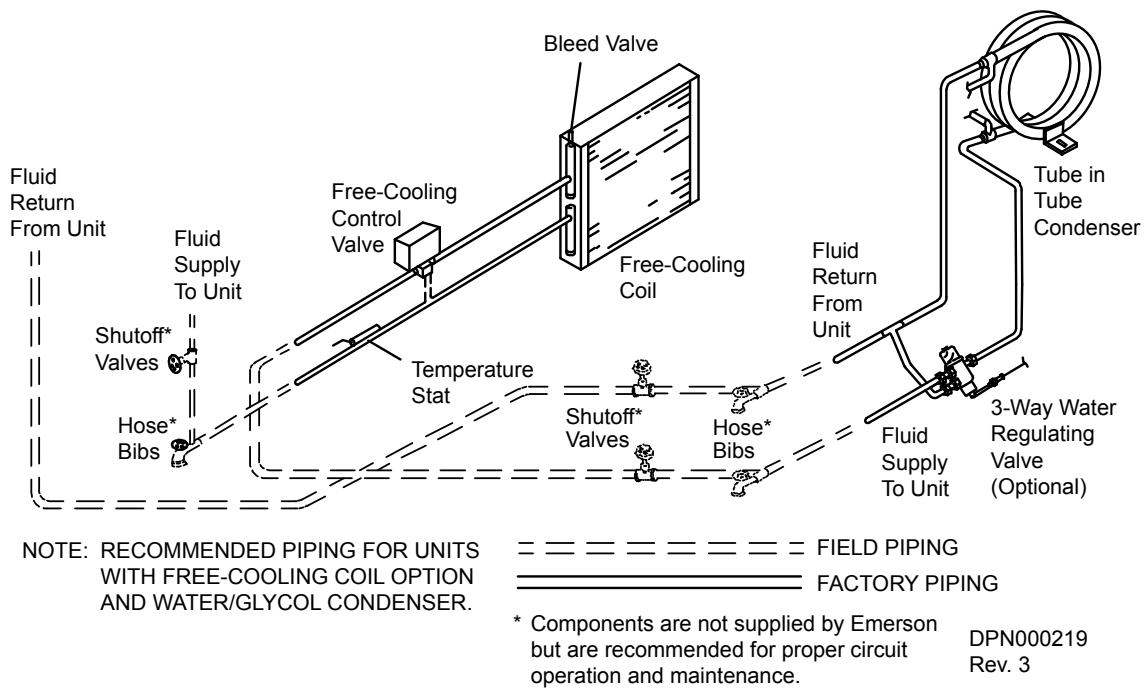
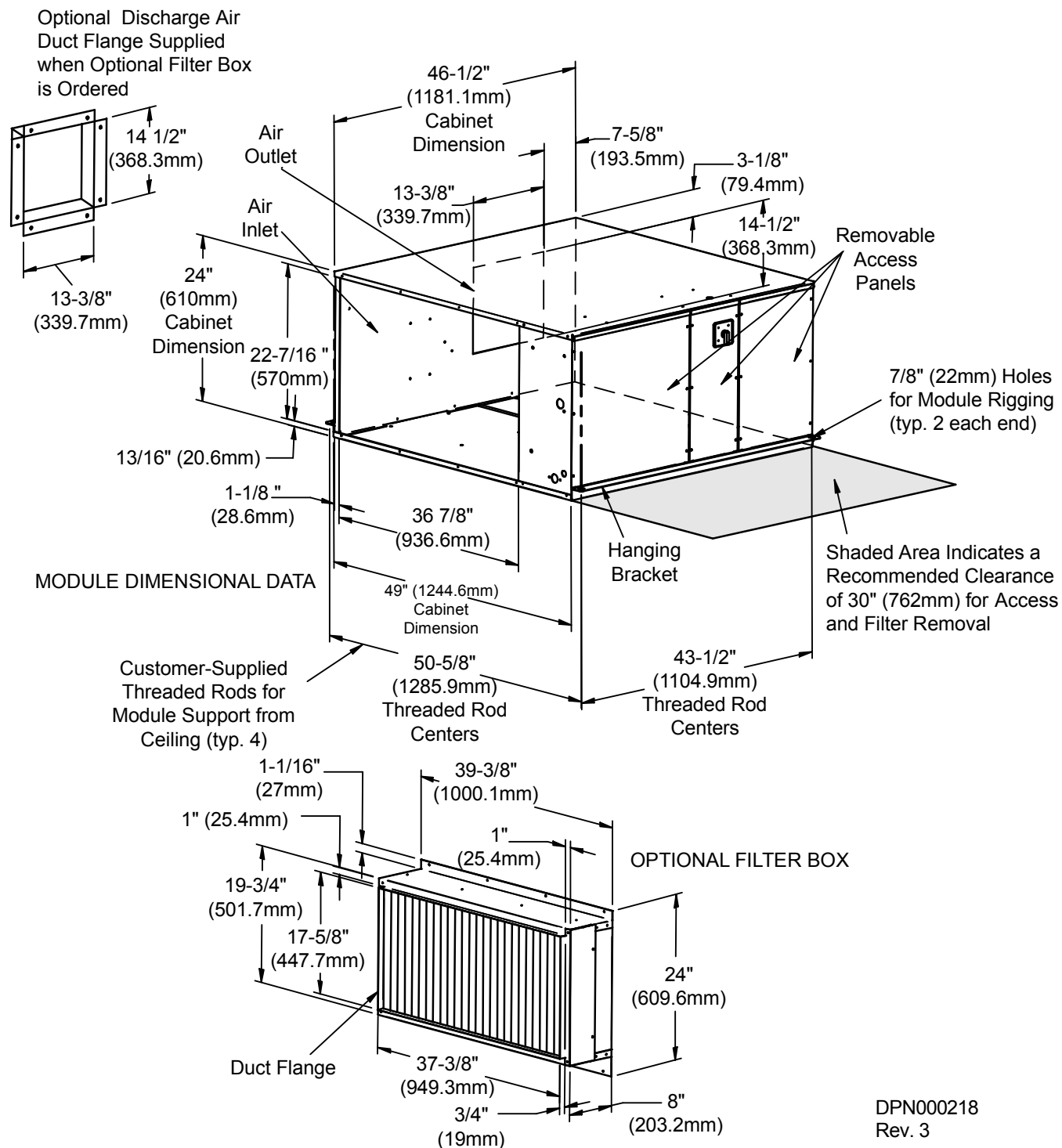
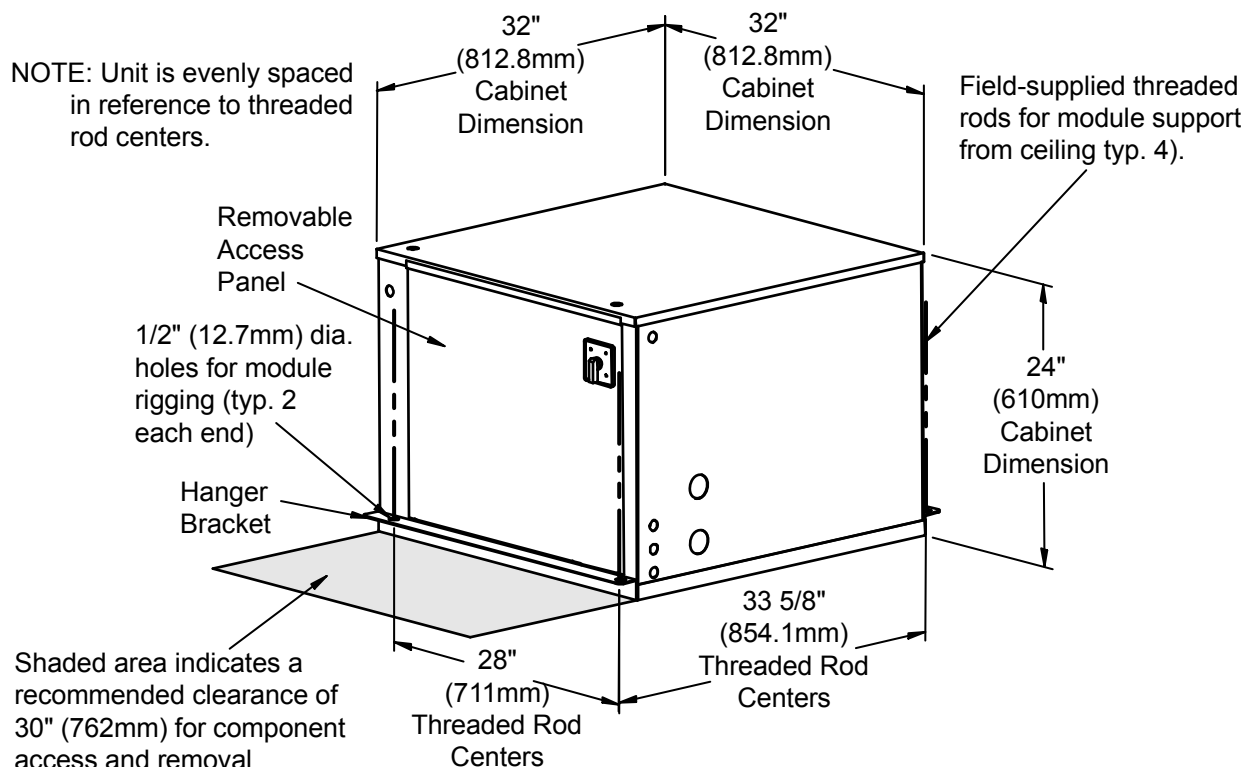


Figure 11 General arrangement, free-cooling coil with water/glycol condensing units

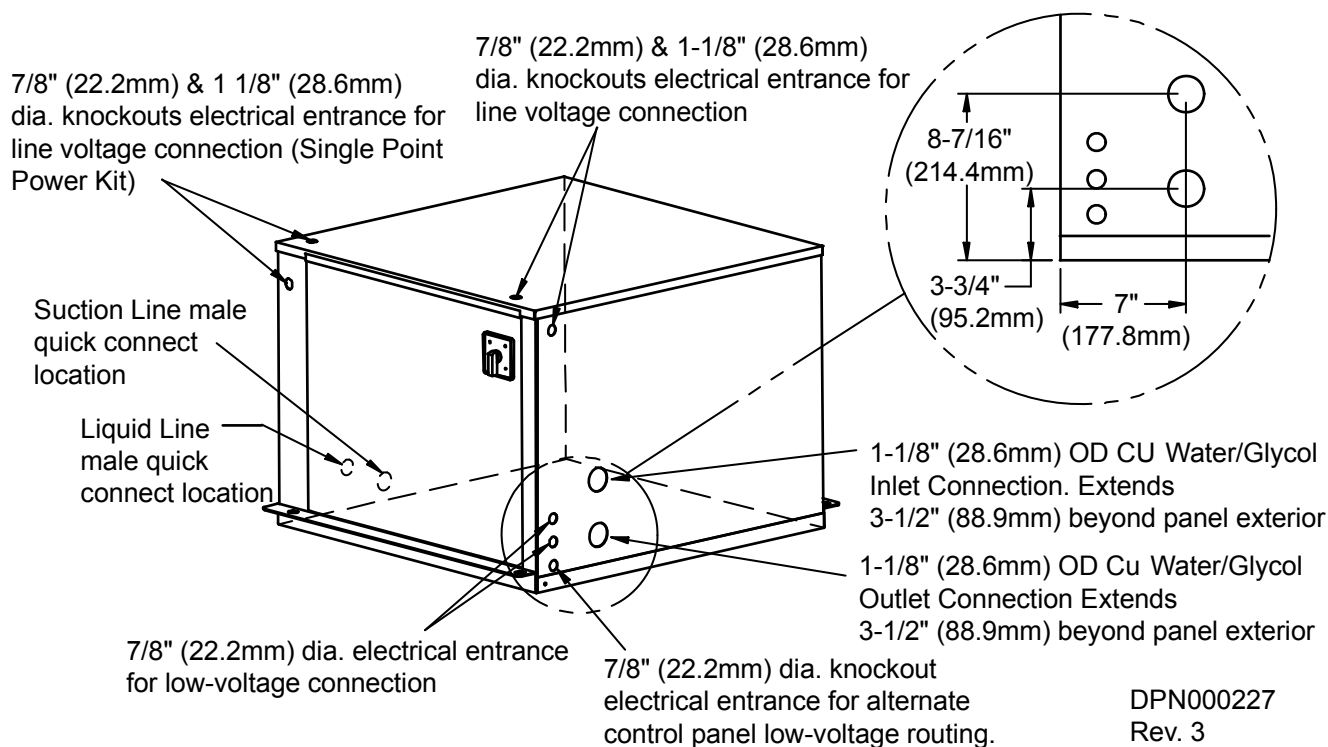


**Figure 12 Dimensions—Evaporator module**DPN000218  
Rev. 3**Table 9 Module net weights—split system evaporator**

Model #		Weight, lb (kg)
60Hz	50Hz	
MM*60E	MM*59E	498 (226)
MM*60K	MM*59K	530 (240)

**Figure 13 Dimensions—Water/glycol-cooled indoor condensing unit**


### WATER/GLYCOL DIMENSIONAL DATA



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**Table 10 Net weight, indoor condensing modules, water/glycol systems**

Model #		Weight, lb (kg)
60Hz	50Hz	
MC*69W	MC*68W	282 (128)

## 8.0 CHILLED WATER SYSTEMS—CAPACITIES AND DIMENSIONS

Table 11 Chilled water data, 60 &amp; 50Hz

CW Model		MMD92C/MMD91C	
Net Capacity Data - kW (Btuh) based on 45°F (7.2°C) EWT & 10°F (5.6°C) temperature rise			
80°F DB, 62.8°F WB (26.7°C DB, 17.1°C WB) 38% RH	Total	20.1 (68,700)	
	Sensible	18.7 (63,900)	
Flow Rate - GPM (l/m)		14.6 (55.3)	
Pressure Drop - ft. water (kPa)		18.7 (55.9)	
75°F DB, 61°F WB (23.9°C DB, 16.1°C WB) 45% RH	Total	16.3(55,600)	
	Sensible	15.1 (51,500)	
Flow Rate, GPM (l/m)		12.0 (45.5)	
Pressure Drop, ft. water (kPa)		12.9 (38.6)	
72°F DB, 60°F WB (22.2°C DB, 15.5°C WB) 50% RH	Total	13.8 (47,200)	
	Sensible	12.8 (43,700)	
Flow Rate, GPM (l/m)		10.3 (39.0)	
Pressure Drop, ft. water (kPa)		9.7 (29.0)	
Fan Data - Evaporator			
CFM (CMH)		2500 (4248)	
Fan Motor, hp (W)		1.5 (1119)	
External Static Pressure, in (mm) water gauge		0.5 (13)	
CW Coil - Copper Tube/Aluminum Fin			
Face Area, ft <sup>2</sup> (m <sup>2</sup> )		5.6 (0.52)	
Coil Rows		4	
Max Face Velocity, fpm (m/s)		444 (2.26)	
Electric Reheat Capacity (Includes Fan Motor), kW (Btuh)			
Input Voltage-208/230/460/575-3-60		11.5 (39,100)	
Input Voltage-380-3-50		10.5 (35,800)	
Input Voltage-400-3-50		11.5 (39,100)	
Hot Water Reheat Coil - Copper Tube/Aluminum Fin			
Capacity (with fan motor heat) using 180°F (82°C) EWT, kW (Btuh)		19.6 (66,800)	
Flow Rate, GPM (l/m)		1.5 (5.7)	
Pressure Drop, ft. water (kPa)		1.5 (4.5)	
Face Area, ft <sup>2</sup> (m <sup>2</sup> )		5.6 (0.52)	
Coil Rows		1	
HWRH supply and return connections, in (mm) OD		5/8 (15.8)	
Humidifier Data - Steam Generator Type			
Steam capacity, lb/hr (kg/hr)		8 (3.6)	
Electrical Input Power, kW		2.8	
Connections, Volume, Filters, Weight			
CW supply and return connections, in (mm) OD		1-1/8 (28.6)	
Humidifier Supply		1/4" OD Copper Compression Fitting	
Evaporator/Condensate Drain		3/4" NPT-Female	
Unit Internal Fluid Volume, gal (l)		2.3 (8.7)	
MERV 8 Filter - Nominal Size, qty 2; in. (mm)		4x20x20 (102x508x208)	
Unit Operating Weight		498 (226)	
Unit Valve Types		On/Off Slow Close	Modulating
Valve Size		1"	1"
Valve Cv		7	11.6
Maximum Static Operating Pressure, psi (kPa)		300 (2068)	400 (2758)
Close-Off Pressure, psi (kPa)		60 (414)	72 (496)

The net capacity data has fan motor heat factored in for all ratings and the entering air conditions of 75°F (23.9°C), 45%RH, is the standard rating condition for ASHRAE 127-2007. All capacities are nominal values; actual performance will be ± 5%.

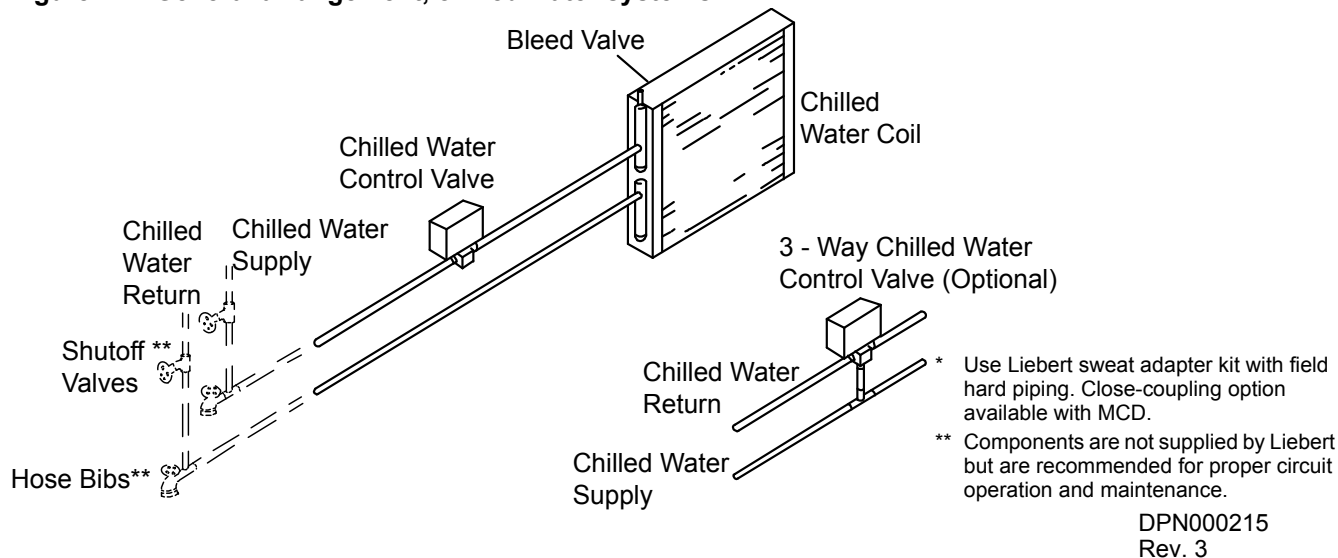
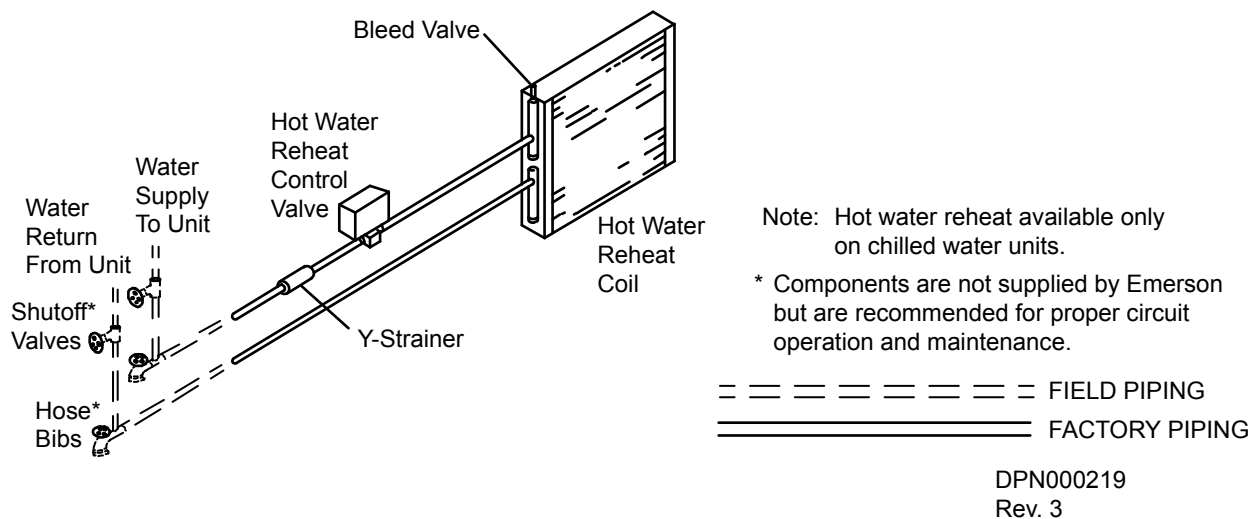
**Table 12** Capacity correction factors for MMD91C & MMD92C based on 10°F (5.6°C) water rise

EWT	72°F (22.2°C) 50% RH		75°F (23.9°C) 45%RH	
	TCC	SCC	TCC	SCC
42°F (5.6°C)	1.28	1.14	1.23	1.12
43°F (6.1°C)	1.18	1.09	1.14	1.07
44°F (6.7°C)	1.09	1.05	1.07	1.03
45°F (7.2°C)	1.00	1.00	1.00	1.00
46°F (7.8°C)	0.92	0.95	0.93	0.96
47°F (8.3°C)	0.85	0.90	0.87	0.92
48°F (8.9°C)	0.79	0.85	0.81	0.88
49°F (9.4°C)	0.73	0.79	0.77	0.82

EWT = Entering Water Temperature

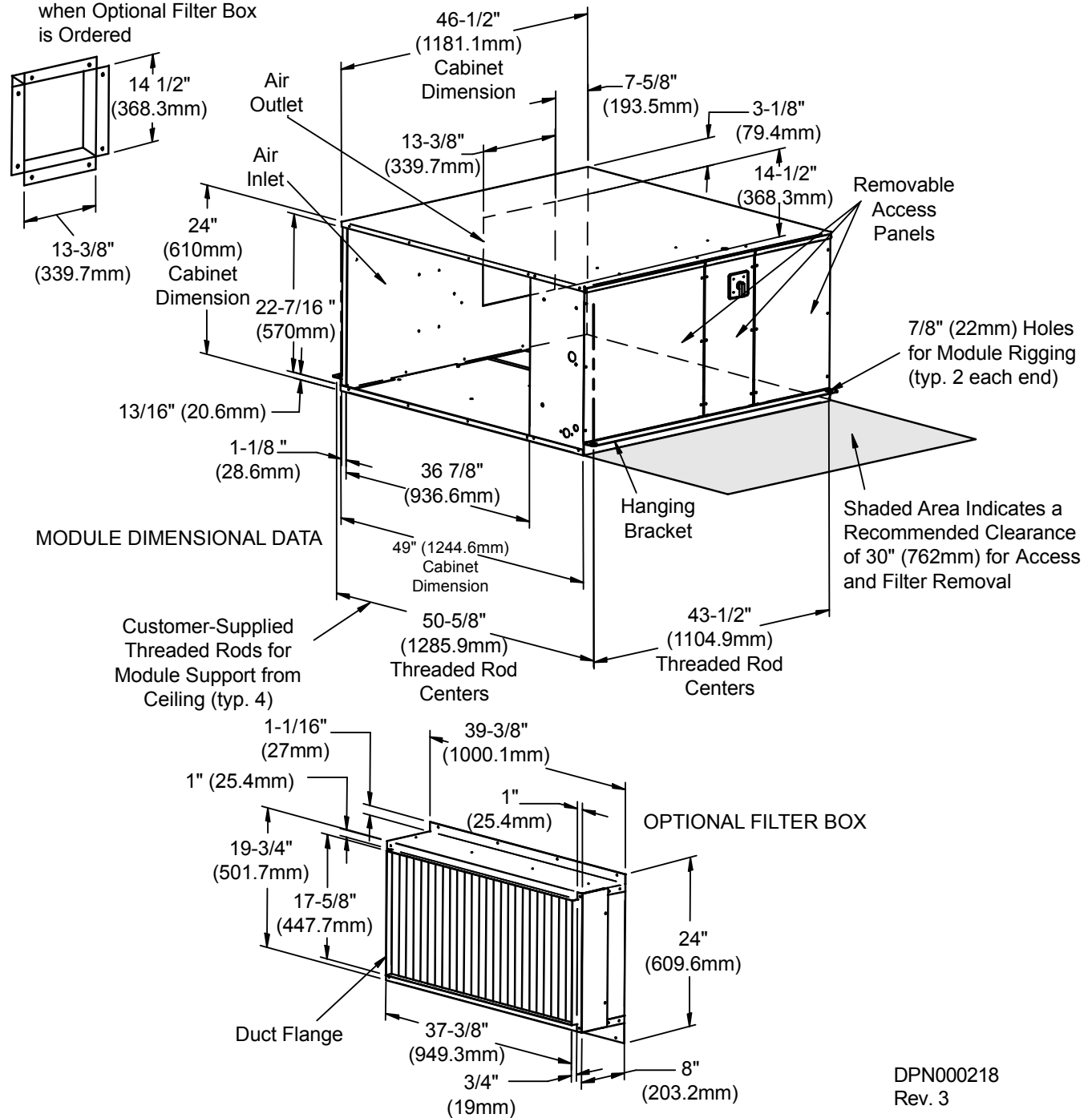
TCC = Total Cooling Capacity

SCC = Sensible Cooling Capacity

**Figure 14** General arrangement, chilled water systems**Figure 15** General arrangement, hot water reheat, chilled water units

**Figure 16 Dimensions—Chilled water module**

Optional Discharge Air  
Duct Flange Supplied  
when Optional Filter Box  
is Ordered



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**Table 13 Net weight—chilled water module**

Model #		Weight, lb (kg)
60Hz	50Hz	
MM*92C	MM*91C	498 (226)

## 9.0 ELECTRICAL DATA

**Table 14 Evaporator and chilled water electrical data, standard 1.5hp motor**

	208-3-60	230-3-60	460-3-60	575-3-60	380/415-3-50
Base Evaporator Model Number	MMD60E/K MMD92C	MMD60E/K MMD92C	MMD60E/K MMD92C	MMD60E/K MMD92C	MMD59E/K MMD91C
<b>Cooling Only</b>					
FLA	5.6	5.6	2.8	2	3.2
WSA	7.0	7.0	3.5	2.5	N/A
OPD	15	15	15	15	N/A
<b>with Electric Reheat</b>					
FLA	33.4	30.7	15.4	12.0	17.6
WSA	41.8	38.4	19.3	15.0	N/A
OPD	45	40	20	15	N/A
<b>with Humidifier</b>					
FLA	15.4	14.5	7.2	5.5	8.3
WSA	19.3	18.1	9.0	6.9	N/A
OPD	20	20	15	15	N/A
<b>with Electric Reheat and Humidifier</b>					
FLA	43.2	39.6	19.8	15.5	22.7
WSA	54.0	49.5	24.8	19.4	N/A
OPD	60	50	25	20	N/A
Base Evaporator Model Number	MMD60E only	MMD60E only	MMD60E only	MMD60E only	MMD59E only
<b>with SCR Reheat</b>					
FLA	47.2	43.3	21.6	N/A	24.9
WSA	59.0	54.1	27.0	N/A	N/A
OPD	60	60	30	N/A	N/A
<b>with SCR Reheat and Humidifier</b>					
FLA	57.0	52.2	26.0	N/A	30.0
WSA	71.3	65.3	32.5	N/A	N/A
OPD	80	70	35	N/A	N/A

1. For Chilled Water units with Hot Water Reheat, use appropriate "Cooling Only" or "with Humidifier" values.
2. SCR reheat not available with Chilled Water Units or units with free-cooling option

**Table 15 Evaporator and chilled water electrical data, optional 2hp motor**

Base Evaporator Model Number	208-3-60	230-3-60	460-3-60	575-3-60	380/415-3-50
	MMD60E/K MMD92C	MMD60E/K MMD92C	MMD60E/K MMD92C	MMD60E/K MMD92C	MMD59E/K MMD91C
<b>Cooling Only</b>					
FLA	5.8	5.8	2.9	2.3	3.7
WSA	7.3	7.3	3.6	2.9	N/A
OPD	15	15	15	15	N/A
<b>with Electric Reheat</b>					
FLA	33.6	30.9	15.5	12.3	18.1
WSA	42.0	38.6	19.4	15.4	N/A
OPD	45	40	20	20	N/A
<b>with Humidifier</b>					
FLA	15.6	14.7	7.3	5.8	8.8
WSA	19.5	18.4	9.1	7.3	N/A
OPD	20	20	15	15	N/A
<b>with Electric Reheat and Humidifier</b>					
FLA	43.4	39.8	19.9	15.8	23.2
WSA	54.3	49.8	24.9	19.8	N/A
OPD	60	50	25	20	N/A
Base Evaporator Model Number	MMD60E only	MMD60E only	MMD60E only	MMD60E only	MMD59E only
<b>with SCR Reheat</b>					
FLA	47.4	43.5	21.7	N/A	25.4
WSA	59.3	54.4	27.1	N/A	N/A
OPD	60	60	30	N/A	N/A
<b>with SCR Reheat and Humidifier</b>					
FLA	57.2	52.4	26.1	N/A	30.5
WSA	71.5	65.5	32.6	N/A	N/A
OPD	80	70	35	N/A	N/A

1. For Chilled Water Units with Hot Water Reheat, use appropriate "Cooling Only" or "with Humidifier" values.

2. SCR reheat not available with Chilled Water Units or units with free-cooling option.

**Table 16 Indoor condensing unit electrical data**

	208/230-3-60	460-3-60	575-3-60	380/415-3-50
<b>MCD65A</b>				
FLA	26.5	12.9	9.7	—
WSA	31.7	15.4	11.6	—
OPD	50	25	15	—
<b>MCD69W</b>				
FLA	20.7	10.0	7.4	—
WSA	25.9	12.5	9.3	—
OPD	45	20	15	—
<b>MCD64A</b>				
FLA	—	—	—	13.7
<b>MCD68W</b>				
FLA	—	—	—	10.0

**Table 17 Outdoor prop fan condensing unit electrical data**

	208/230-3-60	460-3-60	575-3-60	380/415-3-50
<b>PFH067A-_L7</b>				
FLA	24.1	11.7	9.1	11.7
WSA	29.3	14.2	11.1	N/A
OPD	45	20	15	—
<b>PFH067A-_H7 or PFH066A-_H7 High Ambient</b>				
FLA	24.2	11.7	9.3	11.7
WSA	29.4	14.2	11.3	N/A
OPD	50	20	15	—
<b>PFHZ67A-_L7 or PFHZ66A-_L7 Quiet-Line</b>				
FLA	22.5	10.9	8.3	10.9
WSA	27.7	13.4	10.2	N/A
OPD	45	20	15	—



**Table 18 Single-point power kit, air-cooled split system electrical data, standard 1.5hp motor**

	208-3-60	230-3-60	460-3-60	575-3-60	380/415-3-50
<b>Base Evaporator Model</b>	<b>MMD60E/K</b>	<b>MMD60E/K</b>	<b>MMD60E/K</b>	<b>MMD60E/K</b>	<b>MMD590E/K</b>
<b>Base Condensing Unit Model</b>	<b>MCD65A</b>	<b>MCD65A</b>	<b>MCD65A</b>	<b>MCD65A</b>	<b>MCD64A</b>
<b>Cooling Only</b>					
FLA	32.1	32.1	15.7	11.7	16.9
WSA	37.3	37.3	18.2	13.6	N/A
OPD	50	50	25	20	N/A
<b>with Electric Reheat</b>					
FLA	59.9	57.2	28.3	21.7	31.3
WSA	72.0	68.7	34.0	26.1	N/A
OPD	80	80	40	30	N/A
<b>with Humidifier</b>					
FLA	41.9	41.0	20.1	15.2	22.0
WSA	47.1	46.2	22.6	17.1	N/A
OPD	60	60	30	20	N/A
<b>with Electric Reheat and Humidifier</b>					
FLA	59.9	57.2	28.3	21.7	31.3
WSA	72.0	68.7	34.0	26.1	N/A
OPD	80	80	40	30	N/A
<b>Base Evaporator Model</b>	<b>MMD60E</b>	<b>MMD60E</b>	<b>MMD60E</b>	<b>MMD60E</b>	<b>MMD590E</b>
<b>Base Condensing Unit Model</b>	<b>MCD65A</b>	<b>MCD65A</b>	<b>MCD65A</b>	<b>MCD65A</b>	<b>MCD64A</b>
<b>with SCR Reheat</b>					
FLA	73.7	69.8	34.5	N/A	38.6
WSA	89.3	84.4	41.7	N/A	N/A
OPD	90	90	45	N/A	N/A
<b>with SCR Reheat and Humidifier</b>					
FLA	83.5	78.7	38.9	N/A	43.7
WSA	99.1	93.3	46.1	N/A	N/A
OPD	100	100	50	N/A	N/A

**Table 19 Single-point power kit, air-cooled split system electrical data, optional 2hp motor**

	208-3-60	230-3-60	460-3-60	575-3-60	380/415-3-50
<b>Base Evaporator Model</b>	<b>MMD60E/K</b>	<b>MMD60E/K</b>	<b>MMD60E/K</b>	<b>MMD60E/K</b>	<b>MMD590E/K</b>
<b>Base Condensing Unit Model</b>	<b>MCD65A</b>	<b>MCD65A</b>	<b>MCD65A</b>	<b>MCD65A</b>	<b>MCD64A</b>
<b>Cooling Only</b>					
FLA	32.3	32.3	15.8	12.0	17.4
WSA	37.5	37.5	18.3	13.9	N/A
OPD	50	50	25	20	N/A
<b>with Electric Reheat</b>					
FLA	60.1	57.4	28.4	22.0	31.8
WSA	72.2	68.9	34.1	26.4	N/A
OPD	80	80	40	30	N/A
<b>with Humidifier</b>					
FLA	42.1	41.2	20.2	15.5	22.5
WSA	47.3	46.4	22.7	17.4	N/A
OPD	60	60	30	20	N/A
<b>with Electric Reheat and Humidifier</b>					
FLA	60.1	57.4	28.4	22.0	31.8
WSA	72.2	68.9	34.1	26.4	N/A
OPD	80	80	40	30	N/A
<b>Base Evaporator Model</b>	<b>MMD60E</b>	<b>MMD60E</b>	<b>MMD60E</b>	<b>MMD60E</b>	<b>MMD590E</b>
<b>Base Condensing Unit Model</b>	<b>MCD65A</b>	<b>MCD65A</b>	<b>MCD65A</b>	<b>MCD65A</b>	<b>MCD64A</b>
<b>with SCR Reheat</b>					
FLA	73.9	70.0	34.6	N/A	39.1
WSA	89.5	84.6	41.8	N/A	N/A
OPD	90	90	45	N/A	N/A
<b>with SCR Reheat and Humidifier</b>					
FLA	83.7	78.9	39.0	N/A	44.2
WSA	99.3	93.5	46.2	N/A	N/A
OPD	100	100	50	N/A	N/A

**Table 20 Single-point power kit water/glycol-cooled split system electrical data, standard 1.5hp motor**

	208-3-60	230-3-60	460-3-60	575-3-60	380/415-3-50
<b>Base Evaporator Model</b>	<b>MMD60E/K</b>	<b>MMD60E/K</b>	<b>MMD60E/K</b>	<b>MMD60E/K</b>	<b>MMD59E/K</b>
<b>Base Condensing Unit Model</b>	<b>MCD69W</b>	<b>MCD69W</b>	<b>MCD69W</b>	<b>MCD69W</b>	<b>MCD68W</b>
<b>Cooling Only</b>					
FLA	26.3	26.3	12.8	9.4	13.2
WSA	31.5	31.5	15.3	11.3	N/A
OPD	50	50	25	15	N/A
<b>with Electric Reheat</b>					
FLA	54.1	51.4	25.4	19.4	27.6
WSA	66.2	62.9	31.1	23.8	N/A
OPD	70	70	35	25	N/A
<b>with SCR Reheat</b>					
FLA	67.9	64.0	31.6	N/A	34.9
WSA	83.5	78.6	38.8	N/A	N/A
OPD	90	80	40	N/A	N/A
<b>with Humidifier</b>					
FLA	36.1	35.2	17.2	12.9	18.3
WSA	41.3	40.4	19.7	14.8	N/A
OPD	60	60	25	20	N/A
<b>with Electric Reheat and Humidifier</b>					
FLA	54.1	51.4	25.4	19.4	27.6
WSA	66.2	62.9	31.1	23.8	N/A
OPD	70	70	35	25	N/A
<b>Base Evaporator Model</b>	<b>MMD60E</b>	<b>MMD60E</b>	<b>MMD60E</b>	<b>MMD60E</b>	<b>MMD59E</b>
<b>Base Condensing Unit Model</b>	<b>MCD69W</b>	<b>MCD69W</b>	<b>MCD69W</b>	<b>MCD69W</b>	<b>MCD68W</b>
<b>with SCR Reheat</b>					
FLA	67.9	64.0	31.6	N/A	34.9
WSA	83.5	78.6	38.8	N/A	N/A
OPD	90	80	40	N/A	N/A
<b>with SCR Reheat and Humidifier</b>					
FLA	77.7	72.9	36.0	N/A	40.0
WSA	93.3	87.5	43.2	N/A	N/A
OPD	100	90	45	N/A	N/A

**Table 21 Single-point power kit water/glycol-cooled split system electrical data, optional 2hp motor**

Optional 2.0 hp Motor	208-3-60	230-3-60	460-3-60	575-3-60	380/415-3-50
Base Evaporator Model	MMD60E/K	MMD60E/K	MMD60E/K	MMD60E/K	MMD59E/K
Base Condensing Unit Model	MCD69W	MCD69W	MCD69W	MCD69W	MCD68W
<b>Cooling Only</b>					
FLA	26.5	26.5	12.9	9.7	13.7
WSA	31.7	31.7	15.4	11.6	N/A
OPD	50	50	25	15	N/A
<b>with Electric Reheat</b>					
FLA	54.3	51.6	25.5	19.7	28.1
WSA	66.4	63.1	31.2	24.1	N/A
OPD	80	70	35	25	N/A
<b>with Humidifier</b>					
FLA	36.3	35.4	17.3	13.2	18.8
WSA	41.5	40.6	19.8	15.1	N/A
OPD	60	60	25	20	N/A
<b>with Electric Reheat and Humidifier</b>					
FLA	54.3	51.6	25.5	19.7	28.1
WSA	66.4	63.1	31.2	24.1	N/A
OPD	80	70	35	25	N/A
Base Evaporator Model	MMD60E	MMD60E	MMD60E	MMD60E	MMD59E
Base Condensing Unit Model	MCD69W	MCD69W	MCD69W	MCD69W	MCD68W
<b>with SCR Reheat</b>					
FLA	68.1	64.2	31.7	N/A	35.4
WSA	83.7	78.8	38.9	N/A	N/A
OPD	90	90	40	N/A	N/A
<b>with SCR Reheat and Humidifier</b>					
FLA	77.9	73.1	36.1	N/A	40.5
WSA	93.5	87.7	43.3	N/A	N/A
OPD	100	90	45	N/A	N/A

## 10.0 REFRIGERANT PIPING

**Table 22 Refrigerant charge**

Model #		R-407C, oz (kg)
60Hz	50Hz	
MM*60E	MM*59E	4 (0.11)
MM*60K	MM*59K	4 (0.11)
MC*65A	MC*64A	432 (12.3)
MC*69W	MC*68W	94 (2.7)
PFH067A-_L7	PFH066A-_L7	426 (12.1)
PFH067A-_H7	PFH066A-_H7	827 (23.4)
PFHZ67A-_L7	PFHZ66A-_L7	827 (23.4)

All evaporator units and condensing units are fully factory-charged with refrigerant. If field-supplied refrigerant piping is installed, refrigerant must be added; refer to **Table 25** to determine the additional charge.

**Table 23 Recommended refrigerant line sizes**

Equivalent Pipe Length, ft (m)	Liquid	Suction
50 (15)	1/2"	1-1/8"
100 (30.5)	5/8"	1-1/8"
150 (45.7)	5/8"	1-3/8"
Suction line and liquid line sizing based on < 3 psi pressure drop in each and suction line refrigerant velocities >1000FPM (5.1m/s) for proper oil return.		

**Table 24 Pipe length and condenser elevation relative to evaporator**

Nominal System Size Tons	Max. Equiv. Pipe Length, ft. (m)	Maximum PFH Level Above Evaporator, ft. (m)	Maximum PFH Level Below Evaporator, ft. (m)
5	150 (45)	50 (15)	15 (4.6)

Maximum recommended total equivalent pipe length is 150 ft (46m). Suction and liquid lines may require additional specialty items when vertical lines exceed 20 ft. (6m) and/or condensing unit installation is more than 15 ft. (4.6m) below the evaporator. Contact Emerson Application Engineering for assistance.

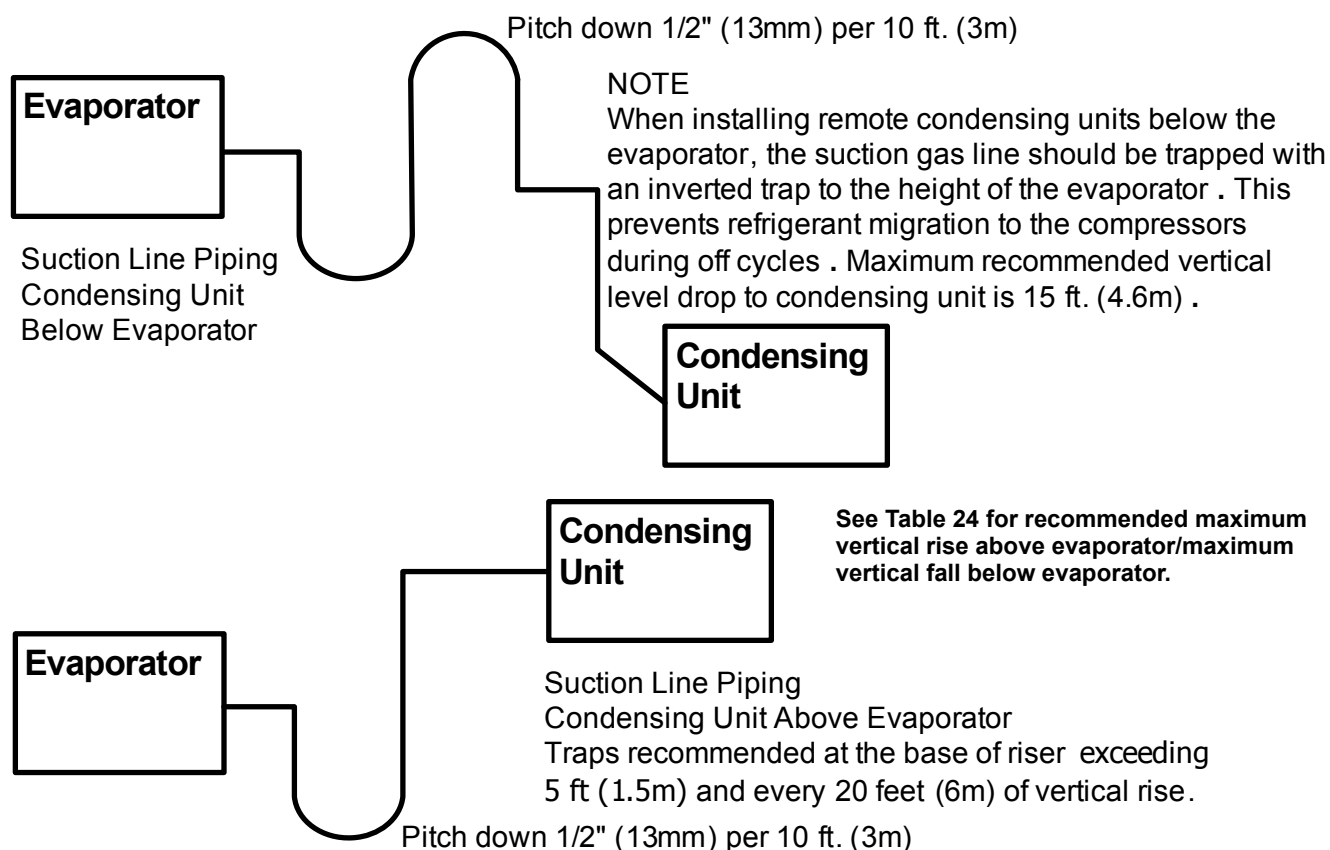
**Table 25 Line charges - refrigerant per 100 ft. (30m) of Type L copper tube**

Line Size, O.D., in.	R-407C, lb/100 ft. (kg/30m)	
	Liquid Line	Suction Line
3/8	3.7 (1.7)	—
1/2	6.9 (3.1)	—
5/8	11.0 (5.0)	0.4 (0.2)
3/4	15.7 (7.1)	0.6 (0.3)
7/8	23.0 (10.4)	1.0 (0.4)
1-1/8	—	1.7 (0.7)
1-3/8	—	2.7 (1.1)

**Table 26** Equivalent lengths for various pipe fittings, ft (m)

Copper Pipe OD, in.	90 Degree Elbow Copper	90 Degree Elbow Cast	45 Degree Elbow	Tee	Gate Valve	Globe Valve	Angle Valve
1/2	0.8 (0.24)	1.3 (0.39)	0.4 (0.12)	2.5 (0.76)	0.26 (0.07)	7.0 (2.13)	4.0 (1.21)
5/8	0.9 (0.27)	1.4 (0.42)	0.5 (0.15)	2.5 (0.76)	0.28 (0.08)	9.5 (2.89)	5.0 (1.52)
3/4	1.0 (0.3)	1.5 (0.45)	0.6 (0.18)	2.5 (0.76)	0.3 (0.09)	12.0 (3.65)	6.5 (1.98)
7/8	1.45 (0.44)	1.8 (0.54)	0.8 (0.24)	3.6 (1.09)	0.36 (0.1)	17.2 (5.24)	9.5 (2.89)
1-1/8	1.85 (0.56)	2.2 (0.67)	1.0 (0.3)	4.6 (1.4)	0.48 (0.14)	22.5 (6.85)	12.0 (3.65)
1-3/8	2.4 (0.73)	2.9 (0.88)	1.3 (0.39)	6.4 (1.95)	0.65 (0.19)	32.0 (9.75)	16.0 (4.87)
1-5/8	2.9 (0.88)	3.5 (1.06)	1.6 (0.48)	7.2 (2.19)	0.72 (0.21)	36.0 (10.97)	19.5 (5.94)

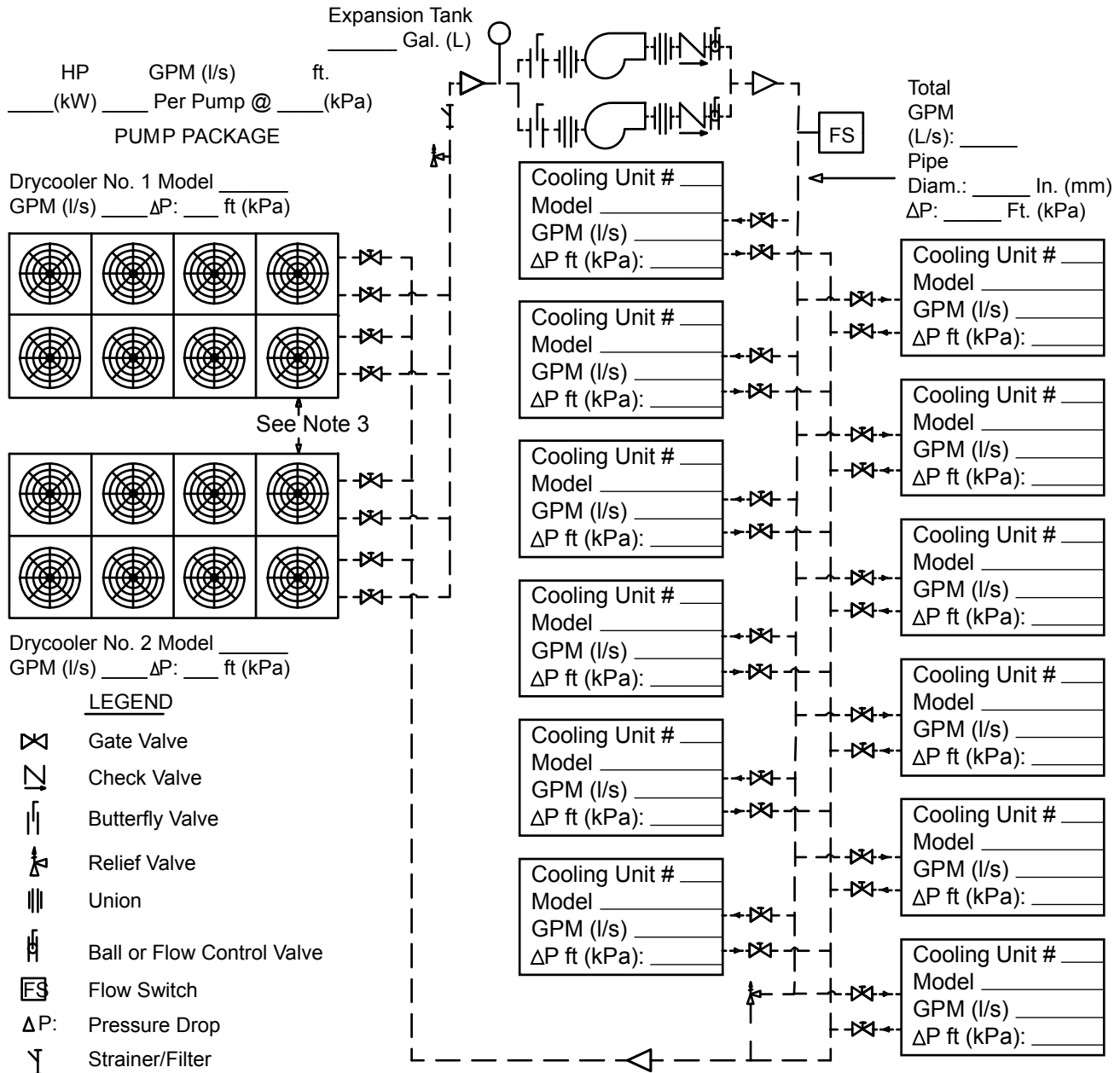
Refrigerant trap = Four times equivalent length of pipe per this table

**Figure 17** Refrigerant piping diagram

## 11.0 GLYCOL LOOP PIPING

Contact Emerson Application Engineering for assistance in choosing correct drycooler models. Refer to **Figure 18**.

**Figure 18 Heat rejection loop, multiple drycoolers and multiple indoor units**



**Notes:**

1. Pressure and temperature gauges (or ports for same) are recommended to monitor component pressure drops and performance.
2. Flow measuring devices, drain and balancing valves to be supplied by others and located as required.
3. See product literature for installation guidelines and clearance dimensions.
4. Drawing shows dual pump package. Alternate pump packages with more pumps may be considered; consult supplier

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## 12.0 MODEL NUMBER NOMENCLATURE—ALL SYSTEMS

Figure 19 Split system evaporators

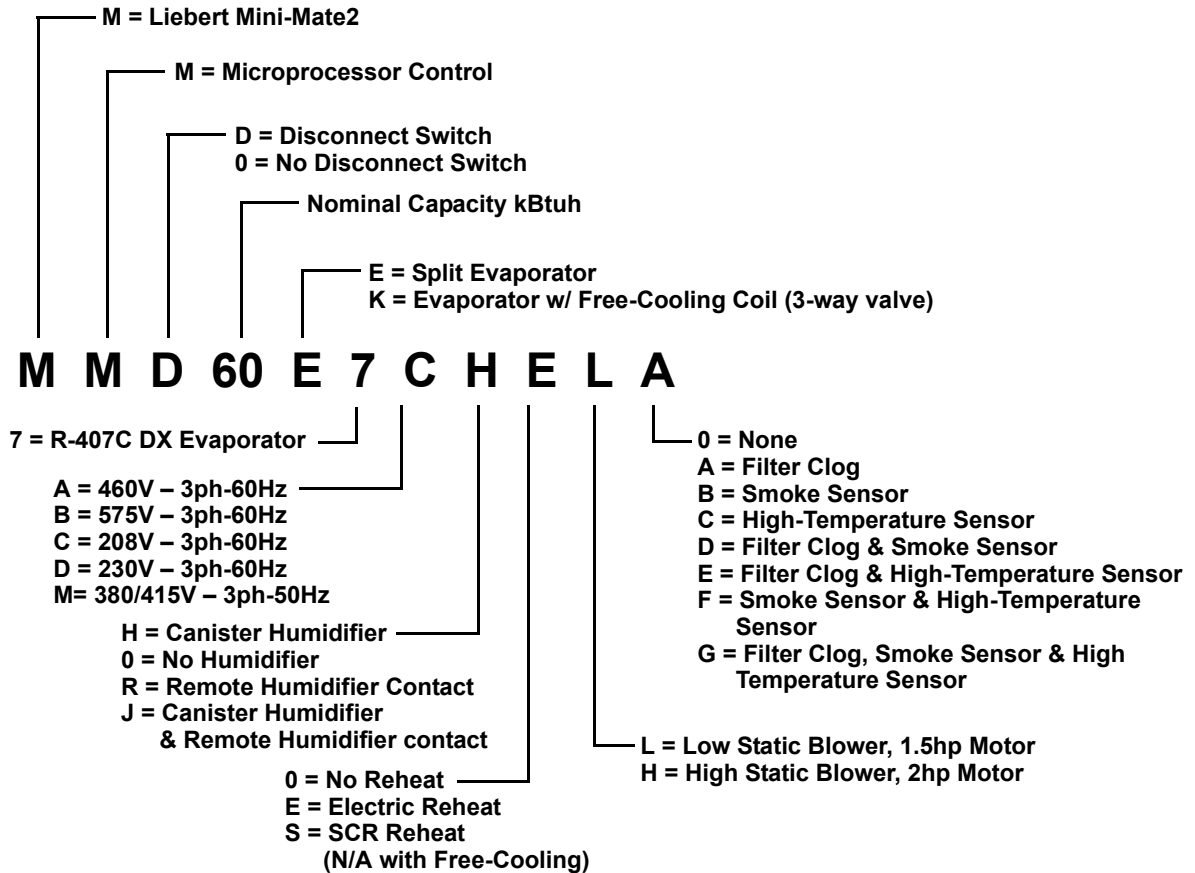


Figure 20 Air-cooled systems—indoor centrifugal condensing units

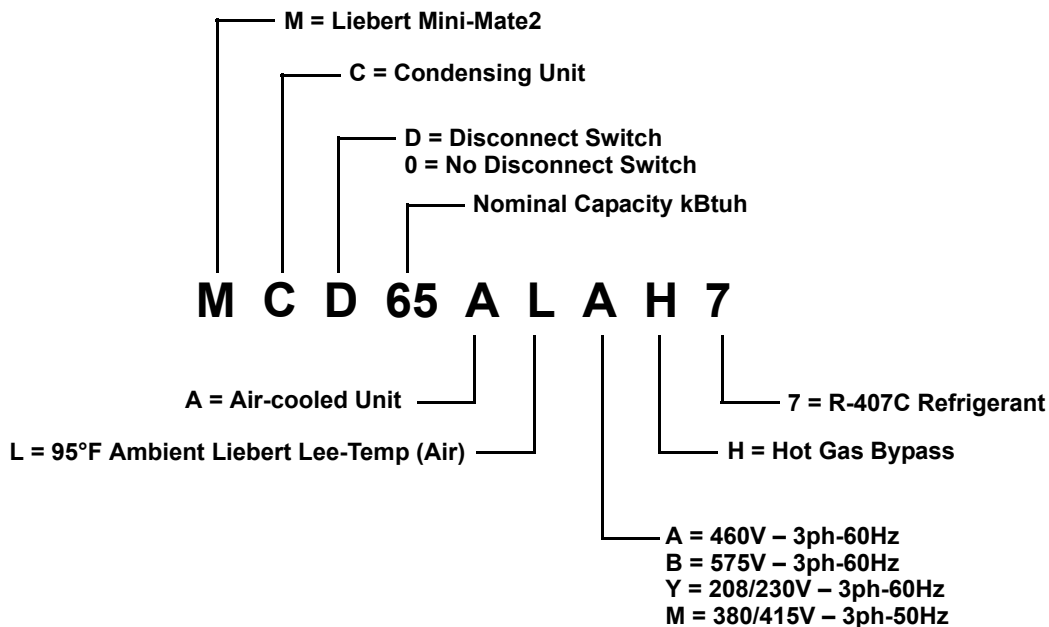




Figure 21 Air-cooled systems—outdoor prop fan condensing units

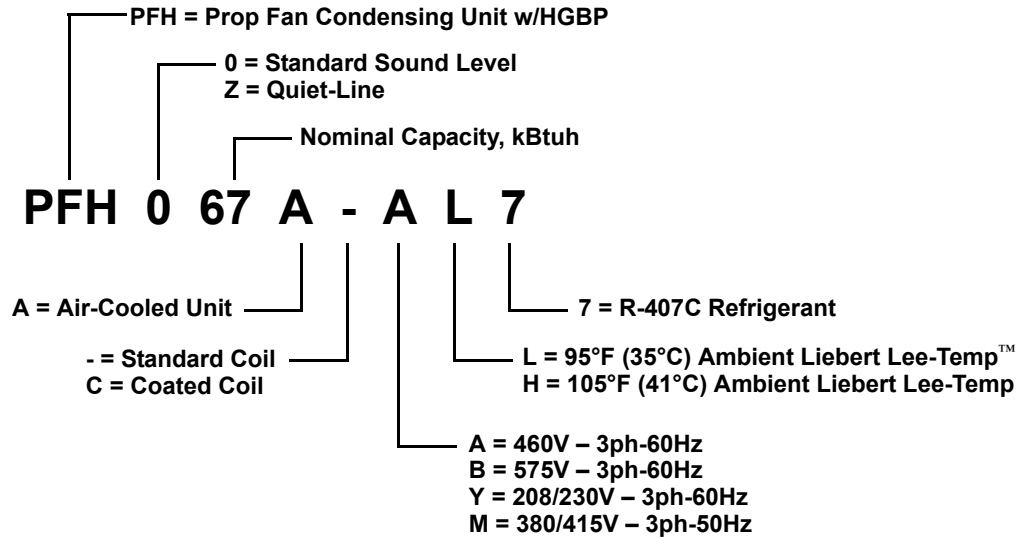


Figure 22 Water/glycol-cooled systems—indoor condensing units

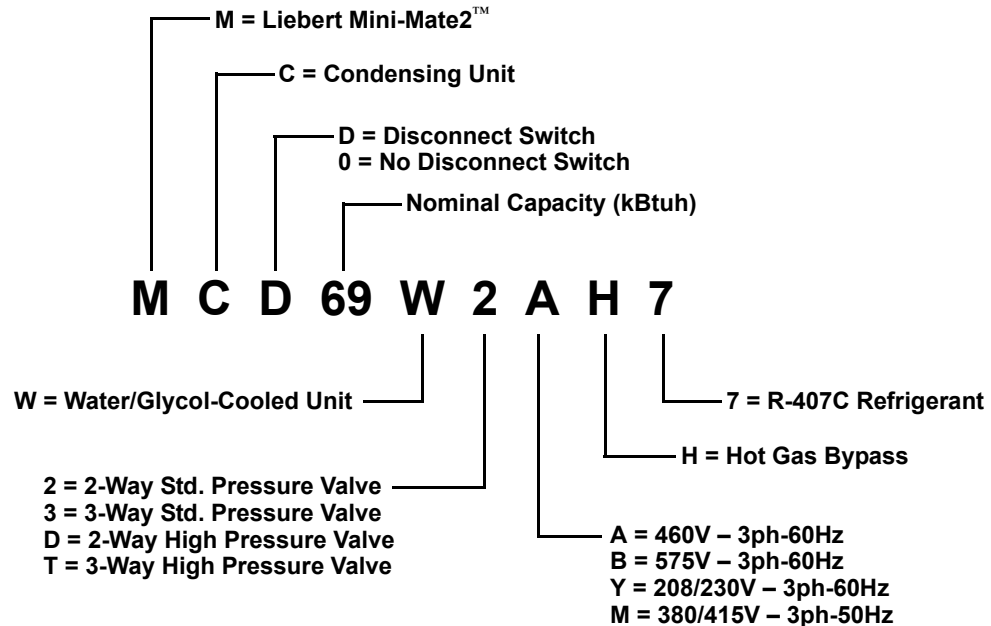
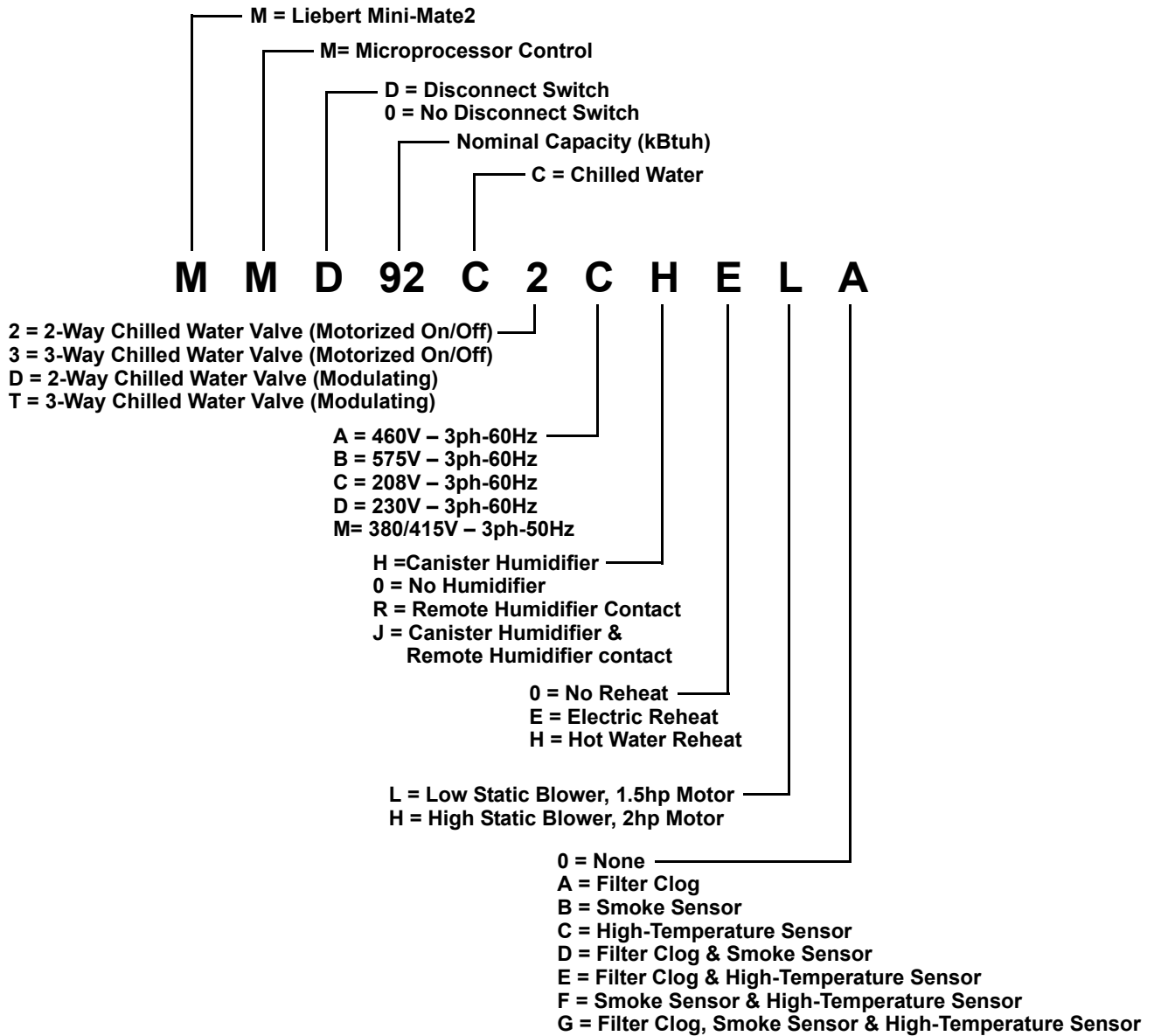


Figure 23 Chilled water systems



## GUIDE SPECIFICATIONS FOR LIEBERT MINI-MATE2- 5-TON SYSTEMS

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### 1.0 General

#### 1.1 Summary

These specifications describe requirements for an environmental control system. The system shall be designed to control temperature and relative humidity conditions within the room.

The manufacturer shall design and furnish all equipment in the quantities and configurations shown on the project drawings.

System shall be supplied with CSA Certification to the harmonized U.S. and Canadian product safety standard CSA C22.2 No 236/UL 1995 for "Heating and Cooling Equipment" and marked with the CSA c-us logo (60 Hz only).

The system model number(s) shall be\_\_\_\_\_.

#### 1.2 Design Requirements

The environmental control system shall be a Liebert Mini-Mate2 factory-assembled unit. On direct expansion models, the refrigeration system shall be split, with the compressor located in a remote or close-coupled condensing unit.

The evaporator section shall be designed for above dropped-ceiling installation. Condensing units shall be designed for either outdoor or above-dropped-ceiling installation.

The system shall have a total cooling capacity of \_\_\_\_\_ BTU/hr (kW) and a sensible cooling capacity of \_\_\_\_\_ BTU/hr (kW), based on the entering air condition of \_\_\_\_\_°F (°C) dry bulb and \_\_\_\_\_°F (°C) wet bulb.

The unit is to be supplied for operation on a \_\_\_\_\_ volt, \_\_\_\_\_ phase, \_\_\_\_\_ Hz power supply.

#### 1.3 Submittals

Submittals shall be provided with the proposal and shall include: Dimensional, Electrical and Capacity data; and Piping and Electrical Connection Drawings.

#### 1.4 Quality Assurance

The specified system shall be factory-tested before shipment. Testing shall include, but shall not be limited to: Quality Control Checks, "Hi-Pot" Test (two times rated voltage plus 1000 volts, per NRTL agency requirements), and Metering Calibration Tests. The system shall be designed and manufactured according to world-class quality standards. The manufacturer shall be ISO 9001 certified.

## **2.0 Product**

### **2.1 Standard Features/ All Systems**

#### **2.1.1 Evaporator Cabinet Construction**

The cabinet and chassis shall be constructed of heavy gauge galvanized steel, and shall be serviceable from one side. Mounting brackets shall be factory-attached to the cabinet. Internal cabinet insulation shall meet ASHRAE 62.1 requirements for Mold Growth, Humidity & Erosion, tested per UL 181 & ASTM 1338 standards.

#### **2.1.2 Air Distribution**

The fan shall be the centrifugal type, double width, double inlet. The shaft shall be heavy-duty steel with self-aligning ball bearings with minimum life of 100,000 hours. The fan motor shall be 1750 rpm (1450 rpm @ 50Hz) and mounted on an adjustable base. The drive package shall be equipped with an adjustable motor pulley. The fan/motor assembly shall be mounted on vibration isolators.

The evaporator system shall be capable of delivering \_\_\_\_ CFM (CMH) at \_\_\_\_ inches (mm) of external static pressure. The fan motor shall be \_\_\_\_ hp (W).

System shall be suitable for ducted air distribution.

#### **2.1.3 Microprocessor Control**

The control system shall be microprocessor-based, factory-wired into the system and tested prior to shipment. The wall-mounted control enclosure shall include a 2-line by 16-character LCD providing continuous display of operating status and alarm condition. A 7-key membrane keypad for setpoint/program control and unit On/Off shall be located below the display. The control display shall be field-wired to the control board using 4-conductor field-supplied thermostat wire.

Temperature and humidity sensors shall be located in the wall box, which shall be capable of being located up to 300 ft (91.4m) from the evaporator unit.

##### **2.1.3.1 Monitoring**

The LCD shall provide On/Off indication, operating mode indication (cooling, heating, humidifying, dehumidifying) and current day, time, temperature and humidity (if applicable) indication. The monitoring system shall be capable of relaying unit operating parameters and alarms to the Liebert SiteScan<sup>®</sup> monitoring system.

##### **2.1.3.2 Control Setpoint Parameters**

- Temp. Setpoint 65-85°F (18 to 29°C)
- Temp. Sensitivity 1 to 9.9°F (1 to 5°C)
- Humidity Setpoint 20-80% RH
- Humidity Sensitivity 1-30% RH

##### **2.1.3.3 Unit Controls**

###### **2.1.3.3.1 Compressor Short-Cycle Control**

The control system shall prevent compressor short-cycling by a 3 minute timer from compressor stop to the next start.

###### **2.1.3.3.2 Common Alarm and Remote On/Off**

A common alarm relay shall be provided to provide a contact closure to a remote alarm device. Two (2) terminals shall also be provided for remote On/Off control. Individual alarms shall be “enabled” or “disabled” from reporting to the common alarm.

###### **2.1.3.3.3 Setback Control**

The control shall be user configurable to use a manual setpoint control or a programmable time-based setback control. The setback control will be based on a 5 day/2 day program weekly schedule with capability of accepting 2 events per program day.

###### **2.1.3.3.4 Temperature Calibration**

The control shall include the capabilities to calibrate the temperature and humidity sensors and adjust the sensor response delay time from 10 to 90 seconds. The control shall be capable of displaying temperature values in °F or °C.

#### **2.1.3.3.5 System Auto Restart**

For startup after power failure, the system shall provide automatic restart with a programmable (up to 9.9 minutes in 6-second increments) time delay. Programming can be performed either at the wall-mounted controller or from the central site monitoring system.

### **2.1.4 Alarms**

#### **2.1.4.1 Unit Alarm**

The control system shall monitor unit operation and activate an audible and visual alarm in the event of the following factory preset alarm conditions:

- High Temperature
- Low Temperature
- High Humidity
- Low Humidity
- High Water Alarm - Lockout Unit Operation
- High Head Pressure
- Loss of Power
- Compressor Short Cycle

#### **2.1.4.2 Custom Alarms (2x)**

- Humidifier Problem
- Filter Clog
- Water Detected
- Smoke Detected

User customized text can be entered for the two (2) custom alarms.

#### **2.1.4.3 Alarm Controls**

Each alarm (unit and custom) shall be separately enabled or disabled, selected to activate the common alarm (except for high head pressure).

#### **2.1.4.4 Audible Alarm**

The audible alarm shall annunciate any alarm that is enabled by the operator.

#### **2.1.4.5 Common Alarm**

A programmable common alarm shall be provided to interface user selected alarms with a remote alarm device.

#### **2.1.4.6 Remote Monitoring**

All alarms shall be communicated to the Liebert site monitoring system with the following information: date and time of occurrence, unit number and present temperature and humidity.

## **2.2 Direct Expansion System Evaporator Components**

### **2.2.1 Direct Expansion Coil**

The evaporator section shall include evaporator coil, thermostatic expansion valve and filter drier.

The evaporator coil shall have 5.6 sq.ft. (0.52 sq.m) face area, four rows deep. It shall be constructed of copper tubes and aluminum fins and have a maximum face velocity of 444 FPM (2.26 m/s) at 2500 CFM (4248 CMH). An externally equalized thermostatic expansion valve shall control refrigerant flow. The evaporator coil shall be factory-charged with R-407C refrigerant and sealed. The evaporator unit can be coupled directly with the condensing unit or mounted remote to the condensing unit.

The coil shall be provided with a condensate drain pan with an internally trapped drain line. The evaporator drain pan shall include a factory-installed float switch to shut down the evaporator upon high water condition.

## **2.2 Chilled Water System Components**

### **2.2.1 Chilled Water Control Valve (On/Off)**

The (2-way) (3-way) control valve shall be motorized slow-acting, non-spring return type to reduce water hammer. Design pressure shall be 300psig (2067kPa) static pressure, with a maximum close-off pressure of 60psi (414kPa).

### **2.2.2 Chilled Water Control Valve (Modulating)**

A (2-way) (3-way) modulating, non-spring return valve controlled by the microprocessor to position the valve in response to room conditions. Design pressure shall be 400psig (2758kPa) static pressure, with a maximum close-off pressure of 72psi (496kPa).

### **2.2.3 Chilled Water Coil**

The cooling coil shall have a minimum of 5.6 sq.ft. (0.52 sq.m) face area, 4 rows deep. It shall be constructed of copper tubes and aluminum fins and have a maximum face velocity of 444 FPM (2.26 m/s) at 2500 CFM (4248 CMH). The coil shall be supplied with 45°F (7.2°C) entering water temperature. The coil shall be supplied with \_\_\_\_\_ GPM (l/s) of chilled water and the pressure drop shall not exceed \_\_\_\_\_ psi (kPa). The coil assembly shall be mounted in a condensate drain pan with internally trapped drain line. The evaporator drain pan shall include a factory-installed float switch to shut down the evaporator upon high water condition.

## **2.3 Indoor Air-Cooled Centrifugal Fan Condensing Unit**

Condensing unit components shall include condenser coil, scroll compressor, high-pressure switch, Liebert Lee-Temp™ refrigerant receiver, head pressure control valve, hot gas bypass system and liquid line solenoid valve. The hot gas bypass circuit shall be provided to reduce compressor cycling and improve operation under low load conditions.

All components shall be factory-assembled, charged with R-407C refrigerant and sealed. No internal piping, brazing, dehydration or charging shall be required. Condensing unit shall be designed for 95°F (35°C) ambient and be capable of operation to -30°F (-34.4°C). The condensing unit can be coupled directly to the evaporator or can be mounted remote to the evaporator.

The condenser coil shall be constructed of copper tubes and aluminum fins. The condenser fan shall be centrifugal type, double inlet, heavy-duty steel shaft, with self-aligning bearings. The fan motor shall operate at 1750 rpm (1450 rpm @ 50 Hz), shall be equipped with adjustable motor pulley, and shall be mounted on an adjustable base. The fan and motor assembly shall be mounted on vibration isolators. The fan motor assembly shall be belt-drive.

The condenser fan shall be designed for 3500 CFM (5947 CFH) at 0.5" (13mm) w.g. external static pressure.

## 2.3 Outdoor Air-Cooled Prop Fan Condensing Unit

Condensing unit components shall include a condenser coil, a direct-drive propeller-type fan, a scroll compressor, high pressure switch, Liebert Lee-Temp™ receiver and head pressure control valve, hot gas bypass system and liquid line solenoid valve. A hot gas bypass system shall be provided to reduce compressor cycling and improve operation under low load conditions.

All components shall be factory-assembled, charged with R-407C refrigerant and sealed. No internal piping, brazing, dehydration or charging shall be required. Condensing unit shall be designed for 95°F (35°C) ambient and be capable of operation to -30°F (-34.4°C).

The condenser coil shall be constructed of copper tubes and aluminum fins.

(Option) The condensing unit shall be designed to operate at a sound level less than 58 dBA.

(Option) The outdoor condensing unit shall be designed for design ambient operation of 105°F (40.6°C).

## 2.3 Indoor Water/Glycol-Cooled Condensing Unit

The water/glycol condensing unit components shall include scroll compressor, high-pressure switch, coaxial condenser, water regulating valve, hot gas bypass system and liquid line solenoid valve. A hot gas bypass circuit shall be provided to reduce compressor cycling and improve operation under low load conditions. All components shall be factory-assembled, charged with R-407C refrigerant and sealed. No internal piping, brazing, dehydration or charging shall be required.

The coaxial condenser shall have a total system pressure drop of \_\_\_\_\_ ft. of water (kPa) and a flow rate of \_\_\_\_\_ GPM (l/s) with \_\_\_\_\_ °F (°C) entering water/glycol temperature.

The condenser circuit shall be pre-piped with a [(2-way) (3-way)] regulating valve that is head-pressure actuated.

The condenser water/glycol circuit shall be designed for a static operating pressure of [(150psi (1034kPa)) (350psi (2413kPa))].

## 2.4 Factory-Installed Options

### 2.4.1 Steam Generating Humidifier

The environmental control system shall be equipped with a steam generating humidifier that is controlled by the microprocessor control system. It shall be complete with disposable canister, all supply and drain valves, steam distributor and electronic controls. The need to change canister shall be annunciated on the microprocessor wall box control panel. The humidifier shall have a capacity of \_\_\_\_\_ lb./hr. (kg/h). An LED on the humidifier assembly shall indicate cylinder full, overcurrent detection, fill system fault and end-of-cylinder-life conditions.

### 2.4.2 Electric Reheat

The electric reheat shall be low-watt density, 304/304 stainless steel, finned-tubular and shall be capable of maintaining room dry bulb temperature conditions when the system is calling for dehumidification. The reheat section shall include a UL-approved safety switch to protect the system from overheating. The capacity of the reheat coils shall be \_\_\_\_\_ BTU/HR (kW), with unit input voltage of \_\_\_\_\_ V, controlled in one stage.

### 2.4.3 Hot Water Reheat

The hot water reheat coil shall have copper tubes and aluminum fins with a capacity of \_\_\_\_\_ BTU/HR (kW) when supplied with \_\_\_\_\_ °F (°C) entering water temperature at \_\_\_\_\_ GPM (l/s) flow rate. Maximum pressure drop shall be \_\_\_\_\_ psi (kPa). The control system shall be factory pre-piped with a 2-way solenoid valve and cleanable Y-strainer. The hot water reheat coil shall be available on chilled water units only.

**2.4.4 SCR Electric Reheat**

The electric reheat shall be low-watt density, 304/304 stainless steel, finned-tubular and shall be capable of maintaining room dry bulb conditions when the system is calling for dehumidification. The reheat section shall include an agency-approved safety switch to protect the system from overheating. The SCR (Silicon Controlled Rectifier) controller shall proportionally control the reheat elements to maintain the selected room temperature. The rapid cycling made possible by the SCR controller provides precise temperature control, and the more constant element temperature improves heater life. The unit microprocessor control shall operate the SCR controller, while cooling is locked on. The capacity of the reheat coils shall be \_\_\_\_\_ BTU/HR (kW), with unit input voltage of \_\_\_\_\_ V. Not available on chilled water or free-cooling units.

**2.4.5 Disconnect Switch, Non-Locking**

The non-automatic, non-locking, molded case circuit breaker shall be factory-mounted in the high-voltage section of the electrical panel. The switch handle shall be accessible from the front of the indoor unit.

**2.4.6 High-Temperature Sensor**

The high temperature sensor shall immediately shut down the system when high temperatures are detected. The high temperature sensor shall be mounted with the sensing element in the return air.

**2.4.7 Smoke Sensor**

The smoke sensor shall immediately shut down the environmental control system and activate the alarm system when activated. The sensing element shall sense the return air conditions. This smoke sensor shall not function or replace any room smoke detector that may be required by local or national codes.

**2.4.8 Filter Clog Switch**

The filter clog switch senses pressure drop across the filters and shall annunciate the wall-box display upon reaching the adjustable setpoint.

**2.4.9 Free-Cooling/Dual Cooling Coil**

A free-cooling coil shall be integral to the evaporator cabinet, and shall be constructed of copper tubes and aluminum fins. The coil shall be rated at \_\_\_\_\_ BTU/HR (kW) sensible cooling capacity with a 45°F (22°C), \_\_\_\_\_ % glycol solution. The coil shall require \_\_\_\_\_ GPM (l/s) and the total unit pressure drop shall not exceed \_\_\_\_\_ feet of water (kPa) when in the free-cooling mode. Free-cooling shall be activated by a temperature stat and shall include factory-piped three-way valve and separate supply and return piping.

Coil is designed for closed-loop applications using properly treated and circulated fluid. Not available with SCR reheat.

An optional Cu-Ni coil is required to prevent premature corrosion if applied to open water tower loop.

A heat exchanger and pump shall be field-supplied to isolate the open water tower loop from the free-cooling loop.

**2.5 Ship-Loose Accessories****2.5.1 Remote Sensors**

The unit shall be supplied with remote temperature and humidity sensors. The sensors shall be connected to the unit by a \_\_\_\_\_ ft. (m) shielded cable.

**2.5.2 Air Filter Box/Duct Flange**

The evaporator section shall be supplied with an air filter box for use with ducted installations.

Two (2) filters shall be included 4" x 20" x 20" (102 mm x 508mm x 508mm) each, pleated type, with a MERV 8 rating, based on ASHRAE 52.2-2007. A duct flange shall be supplied for use on the supply air opening of the unit.

**2.5.3 Condensate Pump**

The condensate pump shall have the capacity of \_\_\_\_ GPH (\_\_\_\_ l/h) at \_\_\_\_ ft. head (\_\_\_\_ kPa). It shall be complete with integral float switch, pump, motor assembly, discharge check valve, duct/wall mountable bracket and reservoir. A secondary float switch shall be provided to permit field wiring to the unit control to shut down the evaporator upon a high water level condition.



#### 2.5.4 Condensate Pump Bracket

A condensate pump bracket shall be provided to mount condensate pump directly to the end of the unit, allowing for easier installation and alignment of the condensate pump.

#### 2.5.5 Refrigerant Line Sweat Adapter Kit

Provide a sweat adapter kit to permit field brazing of refrigerant line connections.

#### 2.5.6 Single Point Power Kit

A single point power kit shall be provided for a close-coupled system to allow a single electrical power feed to supply power to both the evaporator and indoor close-coupled condensing unit.

#### 2.5.7 Liebert SiteScan® Site Monitoring System

A Liebert SiteScan Site Monitoring System Model \_\_\_\_\_ shall be provided for remote monitoring of the Liebert Mini-Mate2™ unit and monitoring of other Liebert support equipment. The Liebert SiteScan system shall have the capability to monitor and change (at the user direction) the temperature and humidity setpoints and sensitivities of each unit. The printer shall provide the user with chronological alarm information. It shall also be capable of being programmed to print out environmental conditions or operating modes at each unit.

Provide indicated quantities of the following:

- \_\_\_\_\_ Leak Detection System(s) Model \_\_\_\_\_
- \_\_\_\_\_ Remote Monitor(s) Model \_\_\_\_\_ + \_\_\_\_\_
- \_\_\_\_\_ Auto-changeover Control(s) Model \_\_\_\_\_

#### 2.5.8 Drycooler

The Liebert drycooler shall be a low-profile, direct-drive propeller fan-type air-cooled unit. The drycooler shall be constructed with an aluminum cabinet and a copper-tube aluminum fin coil and multiple direct drive fans. All electrical connections and controls shall be enclosed in an integral weather-resistant electric control panel section of the drycooler. The unit is quiet and corrosion-resistant.

The drycooler shall be designed for \_\_\_\_\_°F (°C) ambient.

#### 2.5.9 Glycol Pump Package

The system shall include a centrifugal pump mounted in a weatherproof and vented enclosure. The pump shall be rated for \_\_\_\_\_ GPM (l/s) at \_\_\_\_\_ ft. (kPa) of head and operate on \_\_\_\_\_ volt, \_\_\_\_\_ phase, \_\_\_\_\_ Hz.

### **3.0 Execution**

#### **3.1 Installation of Air Conditioning Unit**

##### **3.1.1 General**

Install air conditioning unit in accordance with manufacturer's installation instructions. Install unit plumb and level, firmly anchored to support the unit's weight in location indicated and maintain manufacturer's recommended clearances. Do not mount units above sensitive electronic equipment to minimize risk of water overflow/leakage damage and improve maintenance/service access.

##### **3.1.2 Electrical Wiring**

Install and connect electrical devices furnished by manufacturer but not specified to be factory-mounted. Furnish copy of manufacturer's electrical connection diagram submittal to electrical contractor.

##### **3.1.3 Piping Connections**

Install and connect devices furnished by manufacturer but not specified to be factory-mounted. Furnish copy of manufacturer's piping connection diagram submittal to piping contractor.

##### **3.1.4 Supply and Drain Water Piping**

Connect water supply and drains to air conditioning unit. Unit drain shall be trapped internally and shall not be trapped externally.

##### **3.1.5 Field-Supplied Pan**

A field-supplied pan with drain shall be installed beneath cooling units and water/glycol condensing units.

#### **3.2 Field Quality Control**

Startup air conditioning unit in accordance with manufacturer's startup instructions. Test controls and demonstrate compliance with requirements.



## **Technical Support / Service**

### **Web Site**

[www.liebert.com](http://www.liebert.com)

### **Monitoring**

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### **Three-Phase UPS & Power Systems**

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Outside North America: 614-841-6598

### **Environmental Systems**

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